SB
615
.Q3C8

Class SB615

Book .G3C8

Copyright No.

COPYRIGHT DEPOSIT.

P. B. CRANE.

QUACK GRASS ERADICATION

Prepared Especially for Farmers Desirous of Destroying this Dangerous Pest

BY

P. B. CRANE

FIRST EDITION

WEBB PUBLISHING CO.
ST. PAUL, MINN.

SB615
Q3C8

Copyright, 1910
by
WEBB PUBLISHING COMPANY
ST. PAUL, MINN.

©CLA265653

PUBLISHERS' NOTE.

For many years thinking agriculturists have been watching with great apprehension the rapidly increasing growth and spread of the weed known as quack grass. A few years ago this pest was only found in scattered sections of the northern part of the United States, and on isolated farms, but today there are whole townships and counties that are almost totally infested with the weed. When quack grass takes possession of land, the growing of profitable crops is almost out of the question. To acquaint those farmers, who are unfamiliar with quack grass, with the seriousness of this pest and to offer suggestions as to its eradication, is the purpose of this booklet.

We know of just one man in the United States who has completely and absolutely killed, at will, any considerable quantity of quack grass. We say **absolutely** killed for the reason that there are many experimenters who have been partially

successful along this line. That man is Mr. P. B. Crane of Long Lake, Minn. The result of his work has been carefully scrutinized by competent agricultural experts who have given the result of his work unqualified approval. Up until this time, however, his process has been unknown, Mr. Crane having formerly made it a practice to contract eradication of quack grass and to sell information concerning the process. For the benefit of those farmers who have quack-infested farms at this time, we have persuaded Mr. Crane to publish in book form the results of his investigations, combining with his experience all other known information about the weed.

It has been our endeavor to publish herewith a book which will give full information about quack grass, not only the ideas of Mr. Crane, whose experience we can heartily commend and verify, but the experience of other practical farmers. It should be noted, however, that Mr. Crane is the only one of these experimentors who claims and has demonstrated complete eradication. Reference is also given in these pages to other sources of information, with an idea of making this book a complete compendium on the subject of eradication of this troublesome pest.

In the hope that this collaboration of experience will meet with the approval of practical farmers, and that they will put these suggestions given into practice, we are,

Very truly,

THE PUBLISHERS.

CONTENTS.

CHAPTER I.

What Is Quack Grass?—Hay. Identity. Comparison.

CHAPTER II.

How Quack Grass Grows.—Seeds. How Introduced.

CHAPTER III.

Principles of Eradication.—Different Methods.

CHAPTER IV.

My Story.—Discouragement. Final Success. Nature's Restorative. Rotation of Crops. Feeding the Soil.

CHAPTER V.

The Crane System of Quack Grass Eradication.—Its Accomplishments.

CHAPTER VI.

Eradication Methods.—Cultivation. When to Cultivate. How to Cultivate.

CHAPTER VII.

Eradication with Spray and Cultivation.—Formula for Spray. Use of Spray. Time to Spray.

CHAPTER VIII.

Miscellaneous Suggestions.—Cultivation at Different Seasons.

CHAPTER IX.

Other Methods.—Tar Paper. Smother Crops, etc.

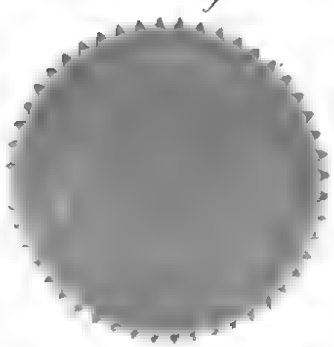
APPENDIX.

A Few Statements Concerning the Efficiency of Mr. Crane's Method.—A List of Standard Agricultural Books.

THIS CERTIFICATE ENTITLES PURCHASER ONLY TO THE USE OF THE CRANE FORMULA HEREIN MENTIONED

Formula for The Spray Used by The Crane System of Quack Grass Eradication.

Dissolve 8 lbs. of sulphate of iron and 2 lbs., of salt in 40 Gallons of water. To this add 2 gallons of sulphuric acid. Stir until the sulphate of iron and the salt are thoroughly dissolved, and the solution is then ready for use.



Note:- This is the Crane Secret Spray Formula for the first time made public in this book.

ALL RIGHTS RESERVED
ALL RIGHTS RESERVED
ALL RIGHTS RESERVED

WEBB PUBLISHING COMPANY
ST. PAUL, MINN.

CHAPTER I.

WHAT IS QUACK GRASS?

A Plant Out of Place.—It has been said that a weed is but a plant out of place, or a plant for which no good use has been found. Quack grass is this kind of a weed, especially in those agricultural sections of the United States where mixed farming is pursued, and the growing of an occasional crop is the rule. Quack grass, together with the wild wheat grasses, to which it is closely related, is found in many sections of the United States. Like the wheat grasses, it is a valuable plant in semi-arid sections where the obtaining of a permanent stand of grass is desired, and where it is difficult to grow the ordinary tame grasses.

Quack Grass Hay is quite nutritious, and quack grass pasture is apparently relished by all kinds of stock. There are some sections of the country where quack grass might become a valuable plant as a regular crop, but in the regions where mixed farming is pursued, it is certainly a plant out of place, and must at all times be considered as a very dangerous weed which a farmer will

Fig. 1. Quack grass (Agropyron repens Beauv.). (a) spikelet; (b) parts of spikelet displayed; (2) empty glumes. (Div. of Agros. U. S. Dept. Agrl.) (Bulletin 83, Experiment Station, Ames, Iowa.)

allow to grow on his farm at his peril. Backed by its wonderful root system, it will survive almost any kind of unfavorable weather or soil conditions where it would be a most difficult problem for other plants to live, and it is so well equipped for a hard life that it will almost totally occupy rich land and crowd out and choke all other tame grasses, small grains and even a corn crop.

A Perennial.—Quack grass belongs to that class of plants that are known as perennials, the name which designates plants that live over from year to year, starting from seed and developing leafage the first season and storing up a food supply in the roots to carry the plant over winter. This is in marked contrast to the growth of such annual plants as start from seed, make all their growth in one season and die after producing a crop. Quack grass is therefore doubly dangerous on account of its long-lived characteristics. It has been a dangerous and troublesome weed in Europe for a great many years, causing vastly increased expense of operating farm land. With our increased labor expense over European conditions the pest is a far greater problem here than abroad.

Judging from its characteristics and habitat, quack grass seems to be essentially a northern weed, being most persistent in the northern tier of states. It is so cosmopolitan in its taste, however, that it is reaching farther south every year, and may soon be nearly as troublesome in the corn belt as it is in the small grain states.

Identity.—Quack grass is known to the scientists as *agropyron repens.* It is quite often confused with a number of other grasses, especially the wheat grasses, to which family in fact it does belong. Without entering into a long discussion or description of these plants, we are publishing herewith photographs of quack grass plants and roots, and also photographs of other plants with which it is commonly confused.

Those who are suspicious of harboring these plants on their farms should make it a point to study the photographs published herewith, and positively identify the weed with which they have to contend.

Most of the experiment stations have published bulletins containing photographs of these different weeds. If the reader is at all in doubt as to the particular weed he has on his place, we would advise taking a specimen of the

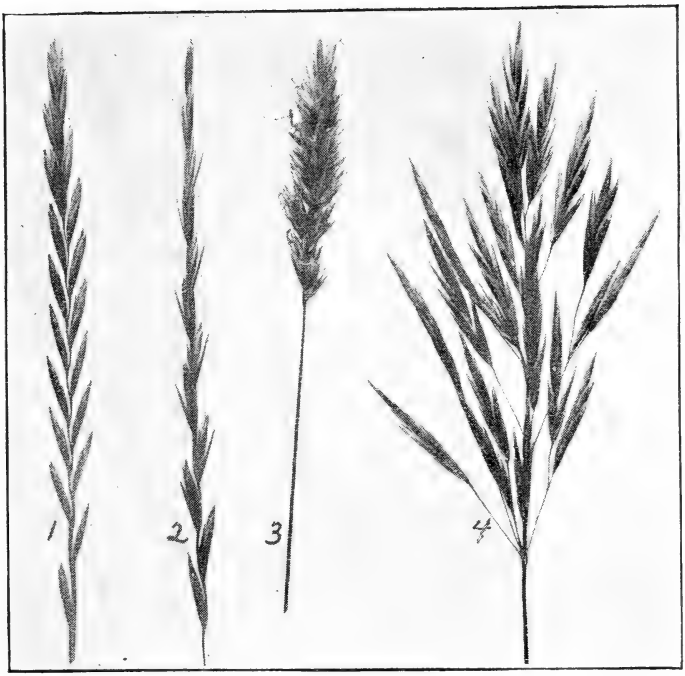


Fig. 2. Heads of (1) quack grass; notice how much closer the spikelets are than in (2) rye grass; (3) true sweet vernal; (4) bromus.

stalk, seed and roots of the weed and sending it to the agronomist at the nearest experiment station.

Comparison.—With reference to the different plants confused with quack grass, Prof. A. D. Wilson, of the Minnesota Experiment Station, has written the following description which appeared in a 1908 issue of The Farmer:

"There are often other plants that are taken for quack grass, either by the similarity of the heads or by the fact that they have underground stems or root stalks. Rye grass has a head somewhat similar to quack (See Figure 2), but the two may usually be identified by the fact that the spikelets on the head of the rye grass are farther apart than on the head of the quack grass. Each spikelet on the quack grass extends past the base of the head next higher on the same side of the head, while in rye grass each spikelet does not reach the base of the spikelet about it (See Figure 2). Rye grass is a plant rather commonly used for a hay crop, especially farther west where the seasons are usually dry. It does not make as good quality of hay as does timothy or bromus. It is not hard to destroy as it has no root stalks and may be distinguished from quack grass by the fact that its roots are fine and fiberous, similar to timothy roots.

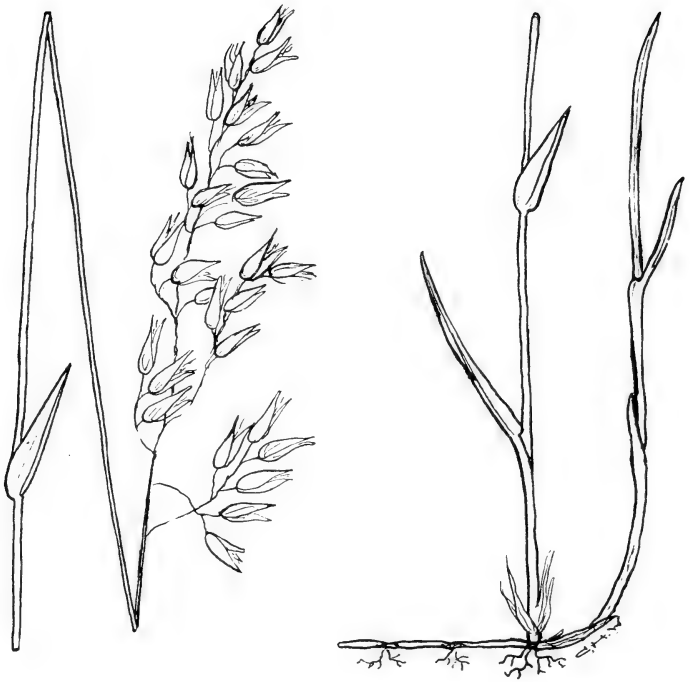


Fig. 3. Root and head of holy grass, commonly called sweet vernal because sweet scented and often mistaken for quack grass in the spring before heading, as it has root stalks.

"Another grass commonly called sweet vernal, though not truely sweet vernal (See Figure 3), is very often taken for quack grass as it has similar underground root stalks. This grass is usually recognized by its sweet, spicy odor and is certainly distinguished from quack grass by it bushy, panicled head, so different from the straight spike of the quack grass.

"Bromus, a cultivated grass quite commonly grown for hay or pasturage, may sometimes be mistaken for quack grass, especially when small. Bromus is rather persistent and after a meadow or pasture of bromus is plowed it often starts in thick bunches, in the spring, very similar to quack grass and the two are not easily told apart at this stage, as both have underground root stalks. Bromus may be recognized, however, by its broader leaf, and when heads appear, by its broadly spreading panicle (See Figure 2).

"Another class of plants known as muhlenbergia is sometimes mistaken for quack grass, but plants of this class may be told with reasonable accuracy by their scaly root stalks. (See Figure 4.) The heads also are sufficiently different to identify them. (See Figures 1 and 4)."

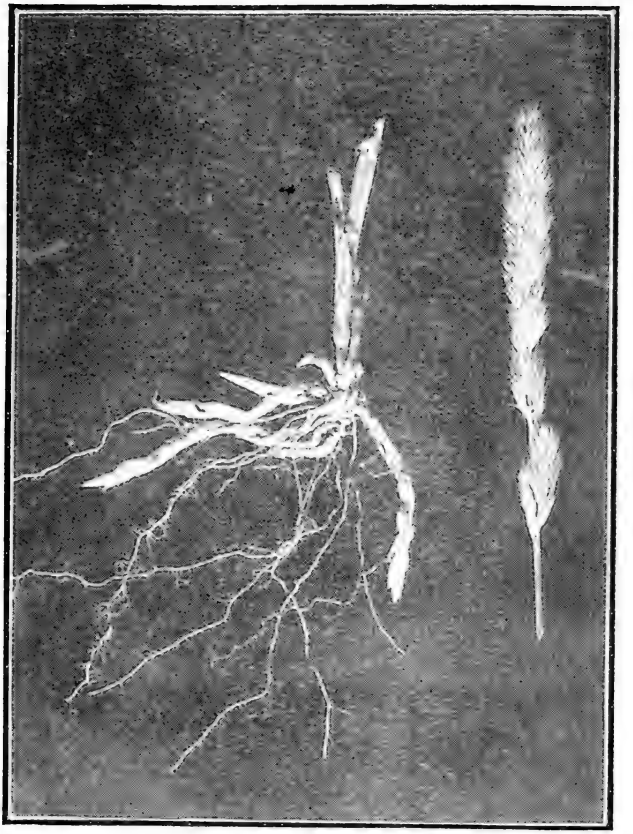


Fig. 4. Roots and heads of one of the muhlenbergias. The roots of all are similar. Note scaly root stalk.

CHAPTER II.

HOW QUACK GRASS GROWS.

Seeds.—Quack grass is usually introduced onto a farm either through the purchase of grass and grain seed or the purchase of hay containing quack. In buying hay a farmer should always be very careful to ascertain whether it comes from a quack grass farm. Quack grass seeds will not all be destroyed by feeding the hay to live stock, and if there is any seed in the hay the chances are that the farmer will later have some strange plants on his farm which he will, in time, identify as quack grass.

Caution.—Until we have pure grain seed laws, when a farmer can tell exactly what he is buying, he is never safe from the introduction of quack grass on his farm. It is most often found in grass seed, and especially in timothy. While the seed is in the husk it is somewhat of the shape and size of blue grass seed or English rye grass, When the kernel shells out the naked seed is about the size of timothy, but longer, and is very likely to slip through without being detected. We reproduce here the photographs of the seed,

both with and without the husk. Look to your grass seed and do not plant any with quack in. This is the first step in prevention.

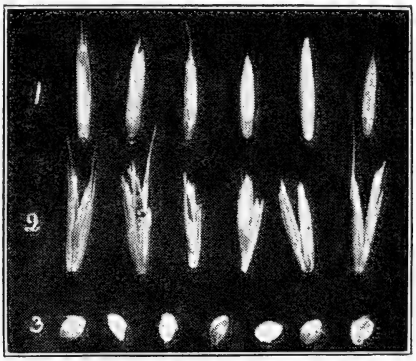


Fig. 5. Seeds of (1) quack grass, single; (2) quack grass with two or more seeds as they grew. They were not separated when shelled. They often appear together in this manner. (3) Pigeon grass.

How Introduced.—Quack grass may be in the hay purchased from neighbors. It may be brought on the farm in screenings. The droppings of animals pastured on quack grass may start the pest, or it may creep under the fence from the neighbors. Once quack grass gets into a community it soon gets the visiting habit and tries to take up its abode on every farm in that community. It is doubly dangerous on account of the insidious manner in which it works its

way onto the land of our good farms, getting a strong foothold before its presence is detected.

The Tremendous Importance of Checking this weed at its first appearance, we cannot emphasize too strongly. A little job of hand digging may do the work at the start, but once the patches begin to appear over the farm, more vigorous measures must be undertaken and some of the remedies mentioned in this book adopted.

There are very few men in the country who can say that they have killed quack grass. Some by tremendous energy and expense, have subdued it to the point where they can grow a profitable crop for one year, but complete eradication is another matter. As long as a single root remains in the soil a constant fight must be waged.

The Wisconsin Experiment Station estimates that it costs $30 an acre to exterminate quack grass by ordinary cultural methods. These methods have usually proven impractical in the hands of the average farmer. We believe that with the ordinary methods in use it will cost far more than this amount, and every farmer knows that the depreciation in the value of land known to be infested is more than the above amount.

A Blessing in Disguise.—Quack grass is not without its merits. It has been called by some

of our authorities a blessing in disguise. It is one of those perennial weeds that finds its best chance to grow on the farm where there is not a proper rotation of crops; in other words, on the farm of the soil robber. Weeds of this kind are Nature's rebuke to the man who believes in continuous cultivation of land and who never gives the soil a rest by seeding down.

It is an actual fact that land which has been cursed with quack grass, when reclaimed, is in an exceedingly fertile condition, the mass of decayed roots and the rest given to the soil having practically rejuvenated it. Nature has merely followed her usual course of rotating crops and building up the fertility of the soil by adding humus and stored plant food in the shape of roots.

A Reclaimed quack grass farm is usually in almost a virgin state of fertility and will pay good interest by way of increased crops for the labor and loss of time spent in eradication. We believe a farmer should not rest content with anything short of complete eradication, such as Mr. Crane has made possible.

CHAPTER III.

PRINCIPLES OF ERADICATION.

In the eradication of perennial weeds there are two principal points to consider:

First, the elimination of the stalk and leaves, or all above ground growth.

Second, the destruction of all roots.

Annual Weeds are as a rule easily destroyed by simple cultivation, or the putting of land into cultivated crops. Barley is a useful crop to handle in connection with winter annual weeds.

A Perennial plant, with an extensive root system, is an entirely different proposition. In a perennial plant, the stalk and leaves are merely the stomach of the plant. True it is that we can keep down growth by shutting off the stomach of the roots and starving them to death, but it is a difficult task.

As long as a single spear of grass can show itself to the sun or to the air, just so long will the roots retain their vitality. Our aim must therefore be to entirely smother and rot them in the soil.

Of the Different Methods of eradication which give partial success, we would especially mention those methods that are based on the starvation of the roots: namely, the use of smother crops or bare fallowing. If a farmer wishes to completely eradicate quack grass from his farm, he must make up his mind to do a most thorough job. He will, by fallowing, lose the use of that land for one year.

Eradication of quack grass requires effectual work and there is no use in temporizing with it. It can be partially subdued and a crop grown, but it creeps in from year to year and will always be an annoyance. A large share of the recent spread of quack grass can be directly traced to this cherished habit that farmers have of trying to eradicate quack grass and attempting a profitable crop at the same time. The crop very seldom turns out in a satisfactory manner. The quack grass is merely tickled by cultivation into further vigor, and the results are unsatisfactory all around.

Farmers who are in dead earnest in their efforts to eradicate quack grass, can do so by the careful following of the Crane System. Furthermore, it will pay them to do this, even though they lose the use of the land for that year. This

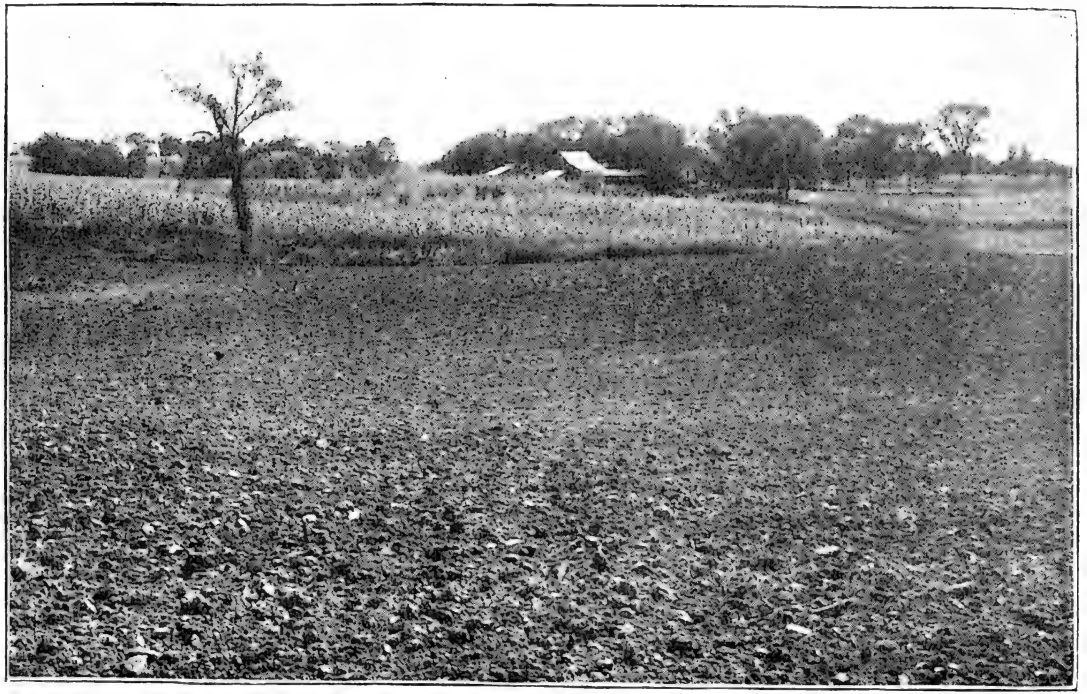


Fig. 6. This field was a solid mat of quack grass May 25th, 1908, when work was commenced. September 7th the above picture was taken, and not a spear of quack was to be seen, nor has there been a live root on the field from that day to this. Produced over 50 bushels of corn to the acre this season, 1909. [Scene on Mr. Crane's Farm.]

is not necessary in all cases, however. In the first place they will be completely freed from the pest, and in the next place their land will be in so much finer mechanical condition, being mellow, fertile, and having all the plant food in the top soil available, that the increase in crops the following year on clean land will surely more than pay for the work of eradication.

Of the different methods of eradication, we would suggest those outlined below as the most practical to follow, which methods are described more in detail in later pages of this book,

Bare Fallowing.—Bare fallowing is the system most commonly advocated; in other words, the laying aside of a piece of land to be plowed in early summer before the quack grass has gone to seed and continuously replowed and harrowed throughout a growing season. This bare fallowing is ordinarily supposed to kill any weed, but unless the cultivator is especially faithful to his task, quack grass will elude him.

Smother Crops.—The use of smother crops is commonly advocated. Even the most enthusiastic advocates of this method do not assert that it will give complete eradication. The growing of buckwheat, sorghum, millet, clover, hemp and other foliage plants that shade

the ground, will keep quack grass in subjection during that season and thus possibly do good, but the roots which persist in the ground will quickly recuperate, and thrive with their original vigor the next season. Of this method we shall have more to say in later pages of this book.

The Crane System.—Mr. Crane's system of complete eradication differs from other methods, in that it gives complete eradication of quack grass without damage to the land and without great expense, as is invariably the case with other haphazard methods. This method consists simply in turning quack grass sod roots under the ground to the point where they will not do any harm, and keeping them there by persistent cultivation, according to prescribed methods, until the roots have decayed. A dry season is supposed to be the proper time to kill quack grass, and the use of fallowing and other methods depend upon dry seasons. On the contrary, Mr. Crane's method does not depend upon the season to any great extent. Of the results of his method there can be no question; the expressions of experts who have kept his fields under continuous inspection being sufficient evidence along this line. Not only has the method proven a success on Mr. Crane's own farm,

but it has proven likewise successful in the hands of other farmers. In the subsequent chapters of this book, Mr. Crane tells the story in his own words. It is the story of a practical farmer, who, by continuous experimentation, and after sad experience, has absolutely cleaned his farm of this weed, which was formerly so abundant that the place was known as "The Quack Grass Farm."

Fig. 7. The Three Sisters. These colts are great great granddaughters of Lockhart (28½) both on the dam and sire's side. They are the sixth generation of Mr. Crane's own breeding and raising in Minnesota.

CHAPTER IV.

MY STORY.

Credentials.—In order to give the proper credentials to the practical farmers who read this book, I will say that I have been in close touch with farm matters all my life, and most of my time has been spent in actual tilling of the soil.

I was born in Milwaukee, Wis., March 6th, 1847, moved to Minnesota in 1869, and spent my early life on a farm in Chippewa County, Minnesota. In later years I conceived the idea of making a fortune in the city, but after a heavy loss by fire in 1897, I went back to my first love — the farm.

The Last Farm which I purchased was in Hennepin county, Minnesota, near Long Lake. I knew that the soil was a heavy clay loam and capable of producing first-class crops.

I did not know anything about quack grass, however, but after my purchase was made, became acquainted with the fact that the farm was very badly infested.

It did not take me very many years to find out that if I did not get rid of quack grass on that

Fig. 8. Sod Shanty. Mr. Crane's Pioneer Home during 1869—until the loghouse was built.

farm, the quack grass would take complete possession and run me off the place.

I Became so Discouraged that I could not sleep nights. The farm was mortgaged, and quack grass was getting more of a hold every day. I fairly cursed these roots from morning to night and loathed working among them; in fact, it was the most discouraging task I ever undertook. After most thoroughly cultivating and disking a field, in three or four days it would again begin to look green with a new growth of grass.

Final Success.—Under such conditions can you wonder that I was compelled to study this pest, and by different methods seek to eradicate it? Can you wonder that I am anxious to tell other farmers of my final success after many years of careful work?

My fields today are open to the inspection of anyone who cares to look at them, and they are as free from quack grass, and all other serious weeds, as was the virgin soil. Moreover, they are in the **best state of fertility** that they have ever been since the land was originally broken up. My land, in the condition which I found it, was worth practically nothing for cropping purposes.

I know of many other such farms that should be worth $100 an acre, which can be rented to-day absolutely free of charge if a man will merely work them.

Today my farm is not only free of this weed, but it is in the finest possible mechanical condition, and I believe as fertile as it ever could be.

I have increased its value from practically nothing, to $300.00 per acre.

This land was a solid mat of quack grass. Today I have a ten acre apple orchard that is entirely free from quack, also raspberries, strawberries and plums. This increased value is solely because of the eradication of quack grass.

I therefore feel no hesitation in advising my fellow farmers on the same subject.

Since everything written has been taken from my own personal experience, I know exactly what I am talking about when I give advice and instruction. All this information has been secured by hard knocks with quack grass itself.

Nature's Restorative.—In these years while I have been studying and fighting quack grass, I have gleaned many other ideas on good farming. In the first place I have found out that quack grass is really a soil builder. When a

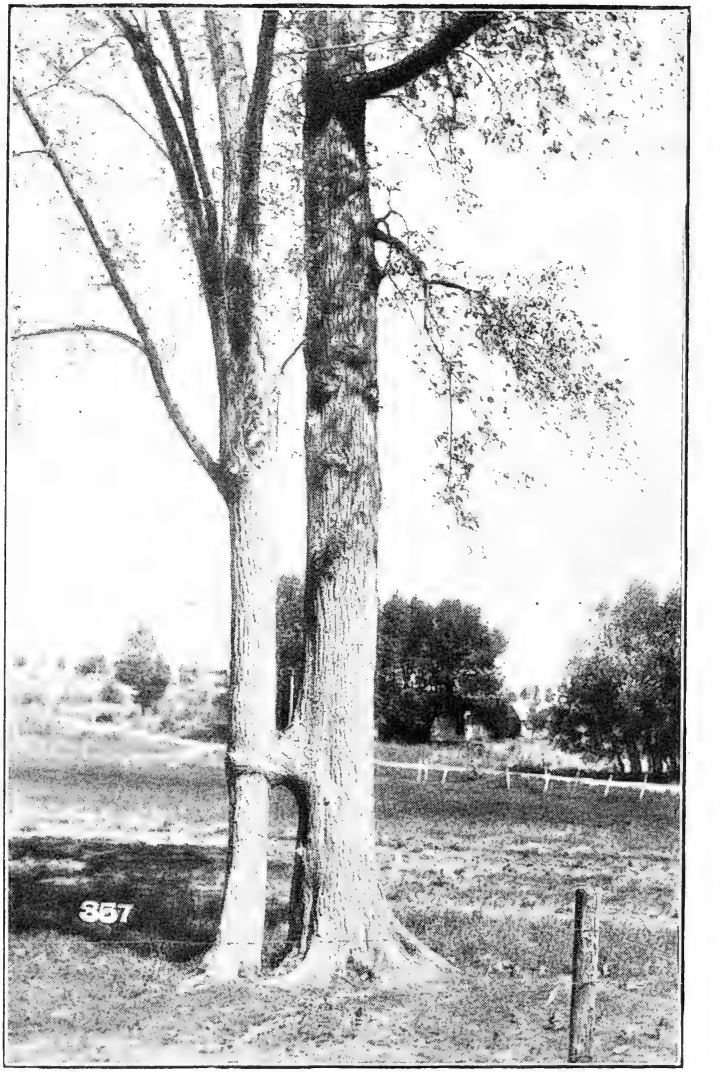


Fig. 9. This twin elm tree stands on Mr. Crane's farm. In early days it was used as a landmark for passersby, and the farm was called the "Twin Elm Farm." Later it became known as the "Quack Grass Farm." Since eradicating the quack grass it is again pronounced the "Twin Elm Farm."

man grows continuous crops of corn and other crops without putting back the proper compensation of fertility in the soil, he soon exhausts this soil of humus and plant food which is so necessary for the continuous growing of good crops. Then Nature starts to growing perennial weeds, such as quack grass and other weeds that have a great root system. This mass of roots in the soil gathers plant food and holds moisture, and after dying and decaying again leaves in that soil the good heart which was originally given to it by the decaying crops of prairie grasses and forest mold. Nature locks up plant food when we farm land improperly. In other words it lacks humus and is out of mechanical condition. Grass roots restore this humus, unlock plant food, and the soil again becomes in good mechanical condition. I believe that some of our richest land today can be found under quack grass sods.

Rotation of Crops.—In the next place I have learned that a sensible rotation of crops is absolutely essential in connection with good farming. We must give land a rest by seeding down to grass occasionally, especially the legumes which not only leave an abundance of roots in the soil, but which take from the air nitrogen and put it into the soil in the form of nitrates ready for suc-

ceeding crops. I have found that where a farmer practices a three or five year rotation of crops, which includes at least a year or two of grass, and feeds out this roughage to live stock, putting back the manure onto the grass land, he will keep the soil in almost a continuous state of fertility, and never find it necessary to purchase commercial fertilizer. This is Nature's way of farming, and I have observed that the closer we follow Nature, the better we will come out financially in our farming operations.

Feeding the Soil.—I have found that we must feed the soil just as we feed our stock, and if we feed the soil we must turn the farm into a factory, sending off of it the finished products in the form of meat and butter, and saving the by-product—manure—and putting it onto the land before its manurial value is wasted. I have found a manure spreader a first-class investment for my farm, and believe it pays for itself every year.

If I have any rotten strawstacks, the refuse goes back on the land. All manure is hauled out and used for top dressing the meadows and the grain fields immediately after the seeding is done. By following this rotation of crops, and the saving of all the manure, we keep all our

capital—the fertility of the soil—right on the farm, and clip off the coupons in the way of finished products.

Cultivation is the foe of all weeds. The greatest benefit I have received in fighting quack grass has been the lesson of cultivation. By turning over the soil by cultivation we liberate all possible plant food, we warm the soil; we mellow it; we aerate it, and get it into the best possible condition for a crop. No hard, lumpy condition of the soil should be allowed to exist. Disk the land until you have pulverized the lumps. When you have seeded the field, and the tiny root of grain starts out in search of plant food, proper cultivation will put that plant food right in its path, but if it strikes a hard lump of earth which the root cannot penetrate, right there the growth is cut short.

The Eradication of Quack Grass is intimately connected with good farming. I have noticed that the richer your land, the easier it is to eradicate quack grass. The poorer your land is, and the less humus it contains, the harder it is to eradicate quack grass. Therefore, when you are working with this weed, always keep in mind the enrichment of your soil.

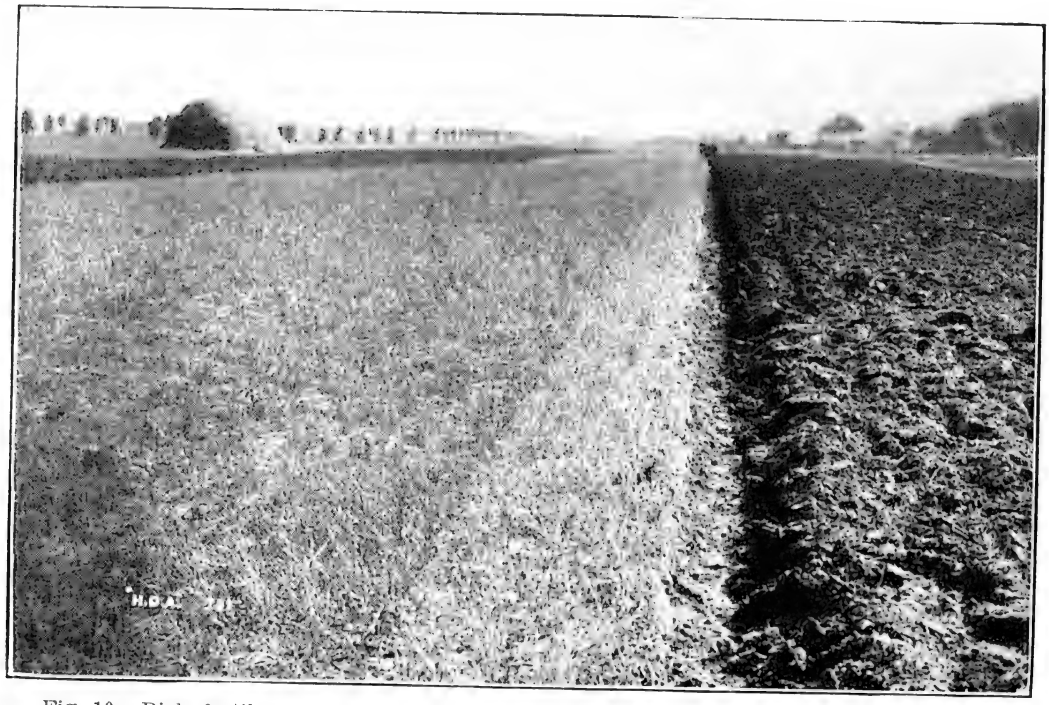


Fig. 10. Rich, fertile ground full of humus is a delight to plow and handle. Quack grass sod properly cultivated and freed of the pest is left in this mellow condition.

You could not find a more worthless forty acre farm in Minnesota than was mine when I purchased it. Today I do not believe you can find a better forty in the state, and I challenge any farmer to produce better crops than I will produce on this re-claimed quack grass farm. I extend a general invitation to every farmer interested in this work, to visit the farm and see the results, as I believe it is the only absolutely re-claimed quack grass farm which exists today.

CHAPTER V.

THE CRANE SYSTEM OF QUACK GRASS ERADICATION.

The Information which has been sent out from the agricultural experiment stations, and through the agricultural press, concerning the eradication of quack grass, would fill volumes. I feel safe in saying, however, that a great deal of this information has not been based upon the actual experience of those giving this information. There are very few people who from actual experience can say that they have subdued quack grass to the point where they can raise profitable crops, to say nothing of complete eradication. Furthermore, the information disseminated has been so conflicting and so imperfect in many cases that the farmer seeking information has become confused and disgusted to the point where he believes that it is entirely impossible to absolutely eradicate the pest.

As Originator of the "Crane System" I claim to be the only man living who has actually reclaimed an abandoned quack grass farm, and to have originated a practical system of eradication

which can be followed by any farmer who cares to study the matter and follow instructions.

The Fields on my farm at Long Lake, in Hennepin County, Minnesota, which were completely taken by a most vigorous stand of quack grass, can be inspected by anyone who cares to make an investigation; and I challenge anyone to produce cleaner fields or a more perfect condition of the soil. These fields have been repeatedly investigated by competent experts whose testimony is given in another portion of this book, and I have at all times kept the standing offer to give $5.00 for any live root or spear of quack grass which can be found on the fields so treated.

Quack grass is undoubtedly one of the worst pests that the American farmer ever had to contend with. On account of its extreme hardiness, and its ability to thrive on most any kind of soil or under most adverse conditions, it seems almost an utter impossibility to destroy it. Thousands of farmers have labored persistently and continuously year after year, trying as best they knew how, to kill, or at least check the growth and further spread of its roots; but in spite of all their toil and precaution Quack Grass has made steady progress. It has spread from the little green patch that was first discovered in the

field, until it has entirely and completely covered said field, and not being satisfied with that, has continued its onward march across the line into the adjoining fields, and along the highways and the byways, and is rapidly creeping into every nook and corner where vegetation grows, and will continue to spread just as long as it is allowed to exist.

Complete Eradication of quack grass is what the American farmer wants today, and were I not able to give you this, there would be no need of this book. Many progressive tillers of the soil can hold quack grass in subjection, and thereby raise a fair crop on his land; but to accomplish this one has to do a great deal of extra work every year, and still the quack grass roots are sufficiently numerous to again thoroughly sod the ground the next season.

It is true that this cultivation is very beneficial to the soil, and where you have applied a proper system of cultivation I have no hesitancy in stating that your field produced an increased yield, and you were rejoiced in that you had gotten a little the best of quack grass. I feel safe is stating that thousands of farmers have applied sufficient cultivation to their quack grass

fields to have completely eradicated the quack, had this work been applied in the proper manner.

For seven years I struggled along in this manner, and all of the time the quack was getting the best of me. In 1902 I used a chemical solution that was strong enough to kill the quack. I applied this to the patches in the field, and those patches are still visible, as it not only killed the quack, but ruined the soil, and those patches are barren today.

My next success was with a spray which would check the growth of the plant so that it would succumb to cultivation. This spray was applied to the grass which was plowed under. Then the ground was thoroughly disked so as to form a dust covering, or mulch, all over the surface of the field. This served to conserve the moisture, also to prevent the evaporation of the spray, and where the disking was repeated every week for seven weeks, the grass was completely gone, and nothing but the dead and decayed roots remained to tell the story. From this I learned that quack grass could be killed by cultivation alone; but cultivation without the spray takes from two to four weeks more time. While it takes more time and cultivation to kill it in this manner, the extra cultivation is very beneficial

to your land. I am sure that you will agree with me (after you have killed your quack) that quack grass has really proved a friend in saving your soil fertility.

I have been a farmer for forty years in the grand old state of Minnesota, and I am free to confess that quack grass has taught me the best lesson that I have ever learned, and that is, **the preparation of the soil for the planting of the seed.**

I raised one hundred and six baskets of corn to the acre this season—1909—where the last crop on said field only produced thirty baskets off the five acres of ground. Quack grass had previously choked out the crop completely.

When my system of eradication reclaims this field that was abandoned from cultivation because of quack grass, and prepares the soil in such condition that it will produce 106 baskets of corn to the acre, I feel justified in saying that quack grass has rejuvenated my land. No fertilizer was used on this field, other than the quack grass roots. The heavier the quack grass, the more productive the soil. Show me a farm that is heavily sodded with quack, and I will show you a farm that is worth good money.

Quack grass is the best indicator of soil quality of any plant that grows. Poor land, under a

Fig. 11. Hay Stack. The above picture shows a field on which quack grass hay was cut in July, 1908, and work of eradication commenced in August. Said field was planted to corn May 14th, 1909, and produced 106 baskets to the acre, and is entirely free from quack grass. [Scene on Mr. Crane's Farm.]

poor system of cultivation is, comparatively speaking, free from quack grass, while in good land under a poor system of cultivation the quack soon takes entire possession.

Quack grass lands that are abandoned from cultivation and used for pasture or hay land, will, in a few years, fail to produce very much forage. Blue grass and white clover, will, apparently, take its place. Should you plow this field, the quack grass roots are there and will be the first to show green on the fields, and will again produce a heavy crop of hay, or supply a good pasture for a few years. Now, if you will apply a good heavy coat of manure as a top dressing, the quack will be the first to respond. The more you encourage quack, the more you enrich your land because of the additional roots produced which become plant food in due course of time.

Quack grass is a surface plant, never growing more than three, or in extreme cases, four inches deep of its own accord. You may plow it down 8 or 10 inches, and next season when you again plow, you will turn these roots up, apparently alive and healthy, provided you have raised small grain on that field; but if you have raised a cultivated crop and done the cultivating in a thorough manner, you will find that the roots which you

plowed under to the depth of 8 or 10 inches, have all decayed. Allow me to refer you to your own corn field. I take it for granted that you had a quack grass corn field or you would not have any use for this book. Where you cultivated your corn sufficiently to kill the quack between the rows, you will find, on again plowing that ground, that the old roots lying between the rows of corn are dead; but those in the hill of corn are very much alive clear down to the bottom of the furrow which was turned oven in preparing this ground.

Now, kind reader, if you killed the quack between the rows of corn, what would prevent killing all of it, if the corn was not there?

Experience With Different Fields.—As previously stated, my farm when purchased was famous as a quack grass farm; in fact, it was entirely taken with the pest, and as a consequence was much depreciated in value.

In ridding the different fields of the weed I pursued different methods of eradication with indifferent success, until finally I arrived at definite methods which I have since followed. This experience has differed somewhat, according to the different fields treated, and I shall herein attempt to summarize this experience. In one

Fig. 12. The lower side of this picture shows a field of quack in its natural form. The upper portion of the picture shows where this solid sod was broken up in June, 1907, and treated during that season. Was seeded to wheat in 1908. Produced 18 bushels per acre. Was seeded to speltz in 1909 and produced 40 bushels per acre. Was plowed again this fall, and not a spear of quack has shown itself on the field. [Scene on Mr. Crane's Farm.]

field which had been abandoned for cultivation for many years, the quack grass roots did not extend down more than two and one-half inches and were very small and slender. I plowed this about 8 inches deep, then used the disk every week for six weeks, and then every other week for the balance of the season, commencing June, 1907. (See Fig. No. 12.) This field was seeded to wheat in 1908 and the growth was so heavy that it all lodged and had to be cut with a mowing machine. Even at that I got 18 bushels to the acre. The ground was plowed that fall and the next spring was seeded to speltz. This also lodged and was cut with the mower, raked with the hay rake, and then it yielded 40 bushels per acre. Not a spear of quack can now be found on this field. I shall sow same field to oats next season and shall expect at least 50 bushels to the acre on this ground, and will report the yield.

On one other field I commenced work May 25th, 1908, and on another field on which I cut quack grass hay in July, 1908, I commenced work in August. These two pieces were planted to corn May 14th, 1909. One hundred and six baskets of corn to the acre from these fields,

while the year before no man would have given one dollar per acre for the use of this land.

Another strip along the roadway, cut of which is herewith submitted, was plowed in the spring, same as the balance of the field, for corn, but the sod was so thick that there was no show for the corn to grow. In August I went at this with a certain form of cultivation. This season—1909—this strip was planted to corn with the rest of the field, and no sign of any return of the quack grass. (See Fig. 13.)

On another two-acre piece I had sweet corn in 1908, but the quack had the best of it all the way through. Commencing October 10th, I completely eradicated the quack grass from this field. Same was planted to raspberries this spring—1909—and is in perfect condition. This past season of 1909, I commenced on a low piece of ground May 21st. There was a heavy sod of quack all over the field. On one-half of this field the spray was applied and not on the other half—same cultivation continuous over the entire field. On September 1st, the portion, on which the spray was applied, the quack was completely killed, while on the balance of the field the green still showed in October.

Fig. 13. The above cut shows a strip along the roadway. Said strip was completely sodded with quack grass. August 1st, 1908, I went after this with the disc and cultivator, and completely killed the quack before November 1st. This strip was planted to corn this season (1909) and not a sign of quack has been seen on the strip.

Where eradication without the spray is desired, work of plowing should not be commenced before June 10th; but where the spray is used, work can be commenced as early as May 20th. This work may be commenced as late as November 1st and have the quack killed by the 1st of July of the following year, and by being most thorough with the cultivation it can be completed in early June.

I plowed a heavy sod of quack November, 1908, and June, 1909, it was completely eradicated.

Another field on which cultivation was commenced June 15, 1909, the last work was done on this field, Aug. 25, and it is now entirely free from quack. No plowing was done in this field. The actual labor applied would not amount to the value of five dollars per acre.

On another field, the plowing was done June 20th, 1909. Not a spear of quack has been seen on this field since September 15th. Still another field on which clover and quack grass was cut for hay July, 1909, was plowed in September, the second crop being turned under. This field will be planted to corn in May, 1910, and I will guarantee that it will be entirely free from quack grass, and will produce without a doubt, 60 bushels of corn next season. I do not say this

boastingly, but the conditions warrant it. The cultivation necessary to kill quack grass has pulverized the soil and made a perfect seed bed. Add to that the decayed quack grass and clover and you will understand why I mention 60 bushels of corn per acre. We must feed Mother Earth if she continues to feed us. I believe that the all-wise Creator sent quack grass to teach us that plant food and intensive cultivation are necessary to the production of bountiful crops. When I see the most bountiful crops that these abandoned, but now reclaimed, quack grass fields produce, I sincerely thank the Lord for this great blessing.

CHAPTER VI.

ERADICATION METHODS.

The Crane System of Quack Grass Eradication is based on the principle of turning over the quack grass sod, roots and all, to a sufficient depth so that we can cultivate or disk the top soil **without disturbing the roots.**

Our chief aim then is to keep this sod where we have placed it until the roots are decayed or absolutely dead. We do not want to plow that land again and turn up those roots until we are sure that the roots are absolutely dead, or else the work may have to be done over again.

Plowing.—A field thoroughly sodded with quack grass should first be plowed eight or ten inches deep. If the spray system, described elsewhere in this book, is used, the spraying must, of course, be done first.

Use a breaking plow and lay the sod over flat and smooth.

A jointer should be used on the plow so as to drop the sod down flat in the furrow, and not lay the end edge up on the top of the other

slice. When this plowing is properly done it means the saving of much work.

Effective Plowing.—When it is possible to do so, one should plow around the field, thereby avoiding back furrows. While this may not appeal to some practical farmers as the ideal way to plow, the object in thus plowing is to completely turn the sod under and have three inches of clean dirt on top of the sod after it is turned over.

Disking.—When the plowing is finished, hitch onto the disk and drive the same way that you plow, and lap the disk half way so that you virtually turn all the ground twice.

Disk twice over in this manner.

Care.—In using the disk one should be very careful not to turn the green sod up again, as we must remember at all times that we are trying to keep it underneath the dirt. In case the disk goes too deep, set it so that it will not turn so much dirt, and in some cases the driver must walk.

In our treatment remember we are just turning the top dirt, using this dirt as a blanket, so to speak, to starve out and rot those roots underneath.

Fig. 14. Plowing. This plow does not turn the sod over flat. A jointer should be used so as to drop the sod right down flat on the bottom of the furrow.

Interval.—After you have disked sufficiently —in other words when you have formed a fine dust covering or mulch all over the surface on that field—you can then let the work rest for a week or ten days, when you chould get out your disk and go over it again.

Set the disk at as steep an angle as you possibly can—**be sure of this**—and lap the disk half way each time so that there is no open space left where the center of the disking passes over the ground.

Cross Disk.—During this second disking period, also cross disk and let the work rest for a week or ten days. Then repeat the work.

Stubborn Patches.—On portions of the field where there are especially stubborn patches of quack grass, see to it that you keep up the disking until you have the soil over these patches thoroughly pulverized.

The ends of the field, where you have turned around and packed the ground when you were plowing, should also receive special attention, for it will take extra work there to do a thorough job of pulverizing. I always finish up by going back and forth across the ends several times. I always notice that where I have put on extra work, the result is very evident.

Cultivator.—After you have given the field the fourth disking, as above described, work the field the fifth time with a sulky corn cultivator. The cultivator which I have been using is especially adapted for this work, the points of the shovel being reinforced and the blades made extra heavy for this work in quack grass. **The shovel** should be of such a shape that the roots do not hang over the points, thereby preventing the doing of good work. **The lags** should be placed so close together that you do not miss any of the quack grass roots. Cultivate this ground three inches deep on the fifth week. Cultivate crosswise also and go four inches deep.

The Driver.—Allow me to say a word to the driver of the cultivator. If you have turned over a thick quack grass sod you must remember there are quack grass roots in every inch of this ground, consequently, you must cultivate every inch of the ground, and cultivate at an even depth. Drive the team straight. Do not jerk them first to one side and then to the other, but keep a line on them all the time and see that the tracks from your cultivator are straight.

It is much easier for a team to step straightforward every step than to be turned first to the right and then by a hard jerk on the line back against

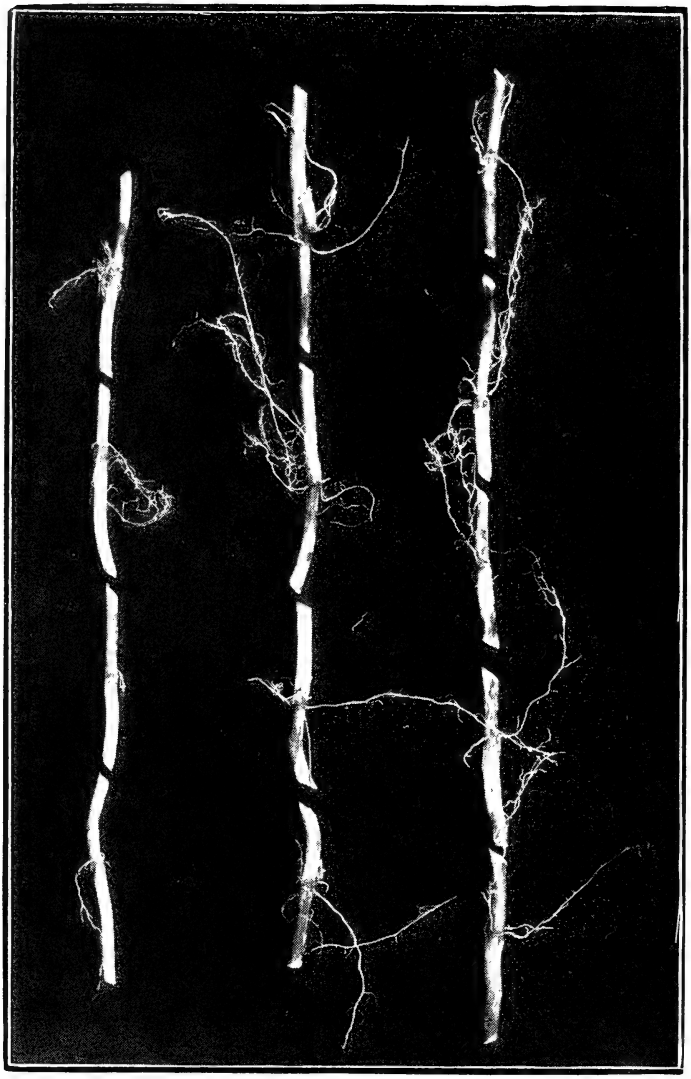


Fig. 15. The above cut shows quack grass roots. They are cut in joints to illustrate that any one of these joints, if left in the ground undisturbed will at once commence to grow.

the whiffletree, and then, by another jerk of the line, swung to the left. The man who expects to kill quack grass successfully must see to it that the cultivating is properly done. In order to be sure of the work every inch of the ground must be disturbed thoroughly every time you go over it, and in order to do this you must drive in a straight line across the field and not leave any ground that is not thoroughly disturbed with the cultivator. Quack grass roots two inches long if left in the ground undisturbed will at once begin to grow. If you realize this fact, you can readily understand why it is absolutely necessary that the cultivation be done in a thorough and workmanlike manner. This not only applies to the work with the cultivator, but in all work in eradicating quack grass.

The Harrow.—After you have cultivated this field thoroughly both ways during the fifth week after the plowing was done, the field can again rest for one week, at the expiration of which time you should use the harrow, going over the field both ways until you have shaken the pieces of sod all apart so there are no chunks of sod or clusters of roots hanging together solid enough to hold the moisture. After this harrowing has been done in a proper manner, the disking will finish

the quack. Follow disking as above described every week or ten days. In case you are prevented from doing this work at regular intervals, do not forego it entirely but give a double dose so as to make up for lost time. The result should be nearly the same.

BY ALL MEANS DO NOT RESORT TO PLOWING THE FIELD A SECOND TIME.

Remember, that we must keep those quack grass roots underneath until they are thoroughly rotted.

Wet Fields.—Do not be afraid of wet fields, but follow the above treatment as described. At first I was a little skeptical when plowing land that was water-soaked, but found some of the best work of eradicating was done on these very fields. Never turn around because of low or wet ground; go right through it.

Remember the three methods of cultivation: first, the disk to pulverize the surface; then the cultivator at a depth of three or four inches; then the harrow to shake it to pieces, and finally the disk. This will absolutely insure complete eradication.

Time.—Plowing can be done at any time between May 20th and Nov. 1st. I would not

Fig. 16. Illustration showing complete way in which quack grass occupies the land—note quack grass sod back of plow. Shows sod being plowed in May for purpose of putting the land into buckwheat and other smother crops.

plow in the spring, however, until the quack grass had gotten a good start—say after June 10th. I would prefer to plow at the time when I find the plant the weakest; in other words, just before it has matured a crop of seed. The quack grass can then be cut for hay* and the sod turned over when the roots are the weakest. This means that there will be cultivating to do to kill these roots. If we plow before this time we have all the strength of the roots to fight. Plowing can be done, however, any time after the first of June and about the same results obtained.

Eradication Without Plowing.—There are some quack grass infested fields where it is not necessary to plow in order to kill out the quack grass. For instance, fields that have been in corn, potatoes or other cultivated crops the previous year. In such cases take the disk and go over the ground several times, or until you have cut the surface all to pieces. Then take the cultivator and cultivate three inches deep. Be very certain that the teeth are sharp, then keep them sharp at all times so they will cut the roots off smooth and clean. After cultivating three inches deep, cross cultivate and go four inches deep. Be sure and cut all the ground and do not leave any strips unturned. Be very thorough with this

* NOTE. Be sure to cut hay crop before seed has ripened.

work of cultivating, and make certain that there is not one root left undisturbed. Complete eradication is what we want and what we can have if we are thorough with this work of cultivating. You will be well repaid for extra cultivation, for the reason that you put that ground into the best possible condition for a crop next year—not only in the best mechanical condition, but you will also have made available great quantities of plant food, and your crop the following year should more than repay you for all the work you have put into quack grass eradication.

In case the sod is solid in places you will find it rather hard work the first time over with the cultivator, but stay by it. In my experience, the sod and grass many times have rolled up in front of the shovel until I would have to raise them to clean them out, but I always made it a point to go over such places time and again until I had the sod completely turned up. This method of cultivation is the quickest way to eradicate quack grass, and any field that the disk and cultivator will dig up should be treated in this manner, thus avoiding plowing.

After the surface has been treated as above described, then use the cultivator every two weeks,

and you will soon discover that there is no quack grass growing in that field.

During the next spring, when you prepare for the seeding of any crop that you wish to plant, use the disk in preparing the soil.

Do not plow; this would only turn up a fresh patch of weed seeds and roots which you would have to fight.

Do not be misled by a spell of dry weather for the drier the weather, the more necessary is cultivation. Quack grass roots will lie dormant in the sod through any period of dry weather, and this might lead you to believe that the roots were dead. However, they are only playing "possum," and when moisture comes they will begin to grow. Therefore, I repeat the advice, cultivate more frequently during dry weather than when it is wet.

Moisture is necessary to cause decay of the roots. When there is sufficient moisture in the ground, you can keep it there by your blanket mulch, caused by cultivation.

Cultivation prevents the growth of the stalk and leaves, which is the stomach of the roots, and also retains the moisture, consequently decay must take place.

Cultivation should be **deep and thorough.** Wherever I have treated a field by surface cultivation alone—no plowing whatever—I have always accomplished complete eradication with much less labor, and in a shorter space of time, than on fields that had to be plowed. **Surface cultivation** gets at the roots directly, and with the proper kind of a cultivator you can go deep enough to get under the roots and cut off or draw them to the surface.

Roots that are cut off and remain below will be smothered by the dust covering which the cultivator will produce, and the roots that are exposed to the air and the warm rays of the sun will soon wither and die. If all of these roots could be brought to the surface by one cultivation it would be an easy matter to eradicate quack grass, but this is impossible. You will notice that all roots on the ground are soon dead. Another cultivation of this field brings another supply of live roots to the surface, and soon you will find that they are all dead, provided you have cultivated in the manner described.

CHAPTER VII.

ERADICATION WITH SPRAY AND CULTIVATION.

Using the Spray System.—My first success in killing quack grass was by means of a spray, combined with a system of cultivation.

In experimenting with different kinds of chemicals, I found one or two formulae that would absolutely kill quack grass, but most of them would also ruin the soil for future crops for a year or two. **Salt,** for instance, will kill quack grass, but will poison the soil temporarily until the alkaline matter is washed out. One formula, however, I found especially valuable for use in spraying quack grass fields. It is harmless to the soil when applied as directed.

The formula for this spray is as follows:

Take 40 gallons of water and dissolve 8 lbs. of sulphate of iron and 2 lbs. of salt. To this add 2 gallons of sulphuric acid. Stir until the sulphate of iron and the salt are thoroughly dissolved, and the solution is then ready for use.

Quantity.—The above amount of spray is sufficient for one acre of quack grass, and should

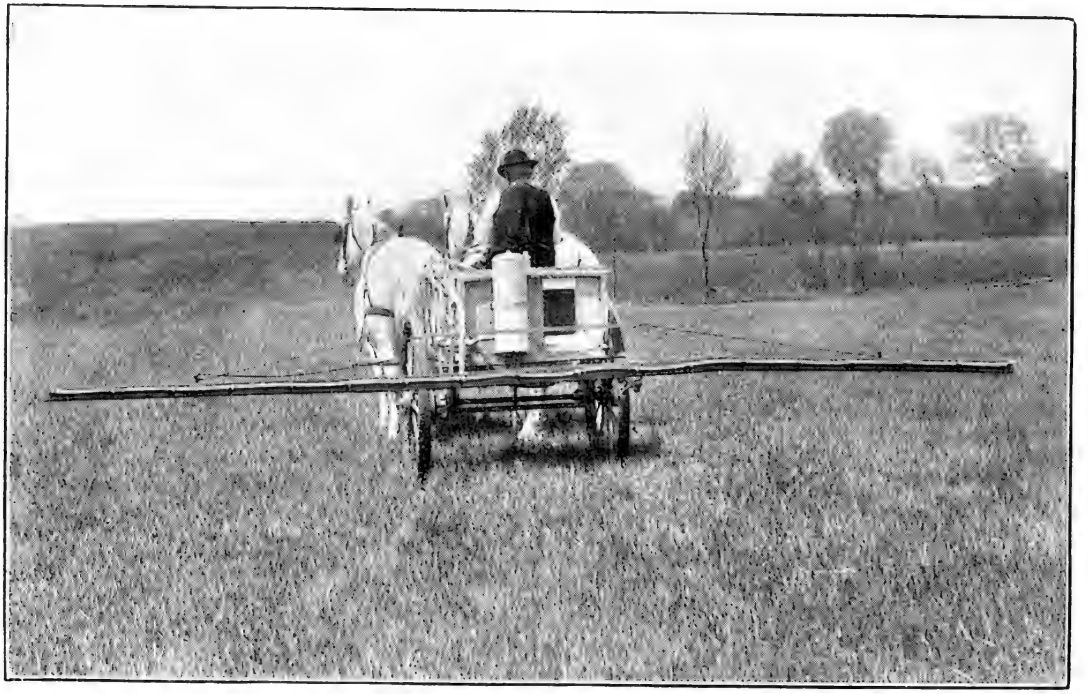


Fig. 17. Mr. Crane just starting to spray his field of quack grass. Note height and thickness of the grass.

be applied in a thorough manner, taking care that every portion of the field is touched with the spray.

Apply the spray twenty-four hours before you begin to plow, and plowing should be finished within four days after spraying. This means spraying only an amount of land that you can plow in four days.

The spray should not be applied while the grass is wet, nor before a rain storm.

We should have two hours of sunshine after spraying, before dew or rain falls upon it.

My idea in spraying is merely to coat the entire quack grass plant with a thin film of the spray mixture. In my experience in spraying, I have used the power sprayer as shown in figure 17.

This is, of course, the most effective way of using the spray, as the mixture comes out in a thin cloud of spray that covers all the grass in the path of the sprayer. Before I purchased my power sprayer, however, I used a small hand sprayer and got about the same results.

Time to Spray.—In spraying quack grass, I have usually used the spray on land where I have previously cut the quack grass for hay. After cutting this hay I have allowed the quack

grass to spring up again until it is four to eight inches high and has quite a foliage. I then spray it in just as effective a manner as possible, and commence plowing it the next day following the day on which I have sprayed.

Heavy Sod.—**Heavy sod** of quack should be plowed with a breaking plow, and turned over just as smooth as possible, and should be seven to nine inches deep. This will give you sufficient loose dirt on top with which to form a mulch of dust covering which will prevent the evaporation of the spray, and will also hold the moisture in the ground, which will cause the roots to decay.

Follow the plowing immediately with the disk, and do not ride the disk the first time over the field, as that would cause it to cut too deep, and thereby turn up more or less sod; this must be avoided, as we want the main sod underneath where it will decay. Have the disk follow the same way of the plow, and lap the disk half way every time. Disk until you have pulverized the surface of the field completely. When this work is completed, your field can rest for two weeks. Then take the disk and go after it again, and lap half way every time. Disk until you have thoroughly pulverized the surface of the field, and where there is a patch more stubborn than

the rest, turn around and go over it until your own good judgment tells you that you have conquered it. Ride the disk always after the first time over the field, and at all times have the disk set at as steep an angle as you possibly can. This turns the ground over and cuts off the roots, and at the same time loosens them from the soil.

Be thorough with this work. Disk it until you have completely killed all the new growth of quack, and have pulverized the sods so that the surface of the field has a perfect dust covering all over it. Then let it rest for another two weeks.

At the expiration of two weeks you will see green blades of quack growing all over the surface of the field, which may seem very discouraging to you. This is not at all discouraging for two reasons: **first,** because the green blades that appear on the surface are very valuable as a fertilizer, and the disking will destroy their growth and cause them to decay, and the more decayed vegetation that you can get in your ground, the more fertile it becomes; **second,** the cultivation necessary to kill this growth will pulverize the ground and at the same time draw the moisture and retain it so that the main sod, which is underneath, must decay. Take your disk and go at it for the third time, lapping the disk half way every

time, and always set at the steepest angle possible. **The team** should walk at a good fair gait —not snail along. The object is to move the ground, therefore, do it.

Cultivator.—After two weeks' rest, take the sulky corn cultivator and go over this field in a thorough manner, cultivating three inches deep. Then cross cultivate and go four inches deep. Be sure and stir every inch of the ground. Let rest for one week and then harrow in a most thorough manner. Frequent disking thereafter will complete the job.

Do not plow this ground for the next crop. Double disking and harrowing will prepare it in excellent shape for the seed.

Stubble Ground.—Where a crop has been raised and harvested, the spray can be applied to the stubble and the plow set at work, plowing six inches deep. Follow this with the disk always set at steep angle. The driver can ride this all the time. Lap half way and go over the field several times, then rest one week and repeat the work. Every time you go over this you will see the improvement in the condition of the ground. The time is short in which to prepare this for the crop next season, therefore it stands you in hand to repeat this work just as often as you can dur-

ing the fall. The fourth cultivation should be with the corn cultivator, going three inches deep the first time over, then cross cultivate and go about as deep as you plowed. Then harrow most thoroughly and the remainder of the work should be with the disk.

In preparing this field for the spring crop, use the disk and harrow only.

Spray and Cultivation Without the Plow.— Where the condition of the ground is such that the disk and corn cultvator will cut up the surface, the plow is not used. Spray the grass and then use the disk with the heaviest driver possible. Disk thoroughly and use the corn cultivator until you have a perfect mulching four inches deep all over the field. Then use the cultivator every two weeks with an occasional harrowing, and soon the quack will not be seen.

This is decidedly the easiest way to kill quack grass. Take a field that was into corn the previous year, the disk and cultivator will do the work if applied as above stated. Where the sod is firm, then the plow must be used. Where the plow is not to be used, the work can be commenced in early April and the field seeded July 1st. Where the plow is used, the work should not be commenced until June. The work may be

commenced as late as November 1st, and the cultivation continued during the early spring. Bear in mind that it takes twelve week's time to make sure that Quack is dead.

Do not plow a piece in April or early May. The grass is too vigorous at this date to even think of giving up its growth for the production of seed, but when it has spent this special energy, it is then using its strength and vitality in the growth of roots, consequently is the more easily combated.

The soil breathes the air just as naturally as a person does, only the respiration is not as frequent. In the fall of the year the soil becomes light and airy, inhaling the air, preparing for the production of another crop the next season. In the spring of the year it closes down and forces the air out and is ready for the seed. In fact, the ground is the storage battery containing the necessary ingredients for the production of vegetation; and before man began to till this land it was rich and fertile.

Nature's Restorative.—If we would continue to let Nature have its way, the soil would grow more fertile year by year. But the farmer gave no thought or care to the future, consequently gave nothing back to Mother Earth. This is

contrary to Nature's laws. Nature provides that vegetation shall grow and decay upon the ground. This decayed matter brings all the other properties into perfect condition, and heavy growth can be had every year. Man, in his shortsightedness, will not even give back the straw that grew on the field, when this is all that is needed, together with thorough tillage, to continue the growth of bountiful crops year after year. This is why quack grass was sent us. The roots continue to grow. The plowing and cultivating kills a portion of them, and they decay and fertilize the ground, and in due course of time will bring that ground back to its original fertility.

CHAPTER VIII.

MISCELLANEOUS SUGGESTIONS.

September Work.—Any field that has raised a crop of small grain can be plowed just as soon as the crop is gathered, and the quack can be killed in time for the seeding in the spring. Plow six inches deep, or a trifle more, being careful to turn the sod completely over. Lap the disk half way over every time so that the open space left in the center of the disk will be avoided. Be very careful to do this. Once over the field in this manner is called double disking. This double disking should be done just as soon after plowing as possible. Then turn and cross disk the field in the same manner. Double disk this field every ten days or two weeks, and weight the disk so that it will cut as deep as the land was plowed. In the spring, give this land two more double diskings and it is ready for the seed. Have your disk sharp so that it will cut right through the sod. Working with a dull disk is merely wasting time. Set it at as steep an angle as possible. Be very careful on these points: namely, covering the entire field; having the disk sharp, and having the disk set at a steep angle all the time.

October Work.—Work of eradication can be commenced at any time, even as late as October, and even into November, but the cultivation should be continued during April and May of the next season, and even to July 1st, in some cases; then put in a late crop, such as millet, buckwheat, flax or fodder corn. Do not seed to any crop until quack is dead. The above crops are merely suggested for the reason that they will usually mature when planted late in the season.

Whenever the field is in such condition that the disk or cultivatior will tear up the sod, do not plow. Use the disk to cut up the surface, and then the cultivator with sharp shovels, going three inches deep. Cross cultivate and go four inches deep. Repeating this cultivation every two weeks is the surest method of killing quack grass. This method means complete eradication by surface cultivation alone and without plowing. Your field will be ready for the seed in the spring by just double disking once.

Abandoned Fields.—Fields that have been abandoned from cultivation, and are firmly sodded with quack, may be handled at any time after June 10th. The method followed should be as described in the chapter headed "Eradication Methods." It takes from ten to twelve

weeks to complete the job where the plow is used. Thus you will understand that a field where work is commenced in November will require all the time until July in which to complete the work. Never plow the ground the second time. Those roots that are so deep that the disk or cultivator does not reach them, will die and decay provided you have kept the green blades from conveying the breath of life to them. Do not feel that the killing of quack grass is the only good that will come from this work, for the improved condition of the soil, together with the decayed quack grass roots, will give you an increase in yield that will amply repay you for this extra work.

Value of Cultivation.—It is an admitted fact that a good crop of small grain can be grown on a field that has been in corn the year before, even though no fertilizer was used in preparing the field for corn. Corn of itself has not enriched the land, but the cultivation necessary to produce this good corn has fertilized the soil so it is mellow and fine, and is in perfect condition for a crop of grain once the seed bed has been prepared. The man who has not learned the great value of proper cultivation, cannot get from his soil the yields which it is capable of producing. We

can take old fields and by plowing them immediately after harvesting, and disking them several times during the fall, then double disk them once in the spring before using the drill, and we will thereby improve the yield of grain from 20 to 30 per cent the first season, and another 15 per cent can be added to this by giving this field a top dressing with your manure spreader after the seed has been sown, or even after it is up. My manure spreader has a six inch tire and I can go over the field without injuring the growing crop. By systematic cultivation, and a reasonable supply of fertilizer, we can soon bring our fields back to their native fertility. Get after your grain fields immediately after the grain is gathered.

CHAPTER IX.

OTHER METHODS OF ERADICATION.

The Tar Paper Method.—On some farms where quack grass has just gotten a start, and where the only visible signs of the pest are a few scattered patches—possibly one or two—the farmer may consider it impractical to take up the extensive system of eradication recommended in other parts of this book, which treatment is largely intended for farms where quack grass has either formed a perfect sod over large fields, or where the patches are so numerous that in time it will do this. The tar paper method of treatment is therefore recommended for these small patches. In using the tar paper method, we work on the same principle as by the cultivation treatment recommended elsewhere, in other words, we keep down all above ground growth over an entire season, thus shutting off the stomach of the plant and starving the roots to death.

In using the tar paper method, merely secure the ordinary tar paper on the market, and cut it in strips sufficiently long to go clear across the patch and extend four or five feet beyond the edge

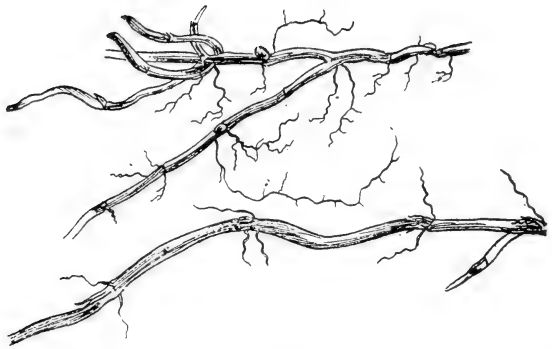


Fig. 17. "Roots" of quack grass buried under tar paper from July 17 to October 7, 1907; "roots" dead in April, 1908. (Bulletin No. 105, Experiment Station, Ames, Iowa.)

of the patch. Be sure to have it extend over the edge, as the roots of quack grass extend out further than the green patches show. If you merely cover the patch, you still leave this circle of roots outside. By running the tar paper over the entire distance, you catch the whole thing. In laying the strips of tar paper, see that they overlap about four inches, then weight down these overlappings with dirt so that no light can get to the patch.

The tar paper method can be used early in the spring, or after the grass has been cut for hay. After putting on the tar paper, however, leave it on for the rest of the season to make sure that you have done proper work. You will then find that the next season this patch of quack should be entirely gone. To make certain, however, that all the roots are dead, we would spade into these patches first and make an investigation.

Treatment for Larger Patches.—Sometimes there are patches of quack grass on the farm that are too large to treat by the tar paper method, and yet too small to use more general cultivation methods, such as are recommended for treating fields. Where these patches are thickly sodded, plow them under and plow deep. Then use the disk until you have formed a good dust covering.

If the patches are so small that you cannot use a double team, then use one horse on your walking cultivator. Put a stone on the cultivator so that it will dig deep. Cultivate both ways and all around the edges. You will quickly observe that the quack grass is being subdued and is less vigorous after each cultivation. Be most thorough with this work, and when it is completed you will find that your ground is in the very best condition for the planting of any crop you may desire. Do not plow when you are ready to put in a crop, but merely disk the ground and it is ready for the seed. The spading harrow is recommended by some experimentors for treating small patches.

Subduing With Smother Crops.—The use of various kinds of smother crops, such as buckwheat, millet, sorghum, and even clover, has been advised by many agricultural experts. **We have never seen it demonstrated, however, that smother crops would actually kill quack grass,** nor do we believe that it will. It is true, however, that when a smother crop is properly used it will keep quack grass down to a few frail plants the year the smother crop is grown. Unless the most careful work is done the following year, however, and the ground persistently cultivated, the quack

grass roots will be found to have been merely lying dormant the year before and getting ready for an extra good crop the following year.

In low lying or wet land, smother crops are practically of no benefit, since in such localities quack grass will make a far more vigorous growth than any smother crop you can grow on that kind of ground, as the result, the quack grass smothers out the smother crop. The use of smother crops in fighting quack grass is based along exactly the same lines as various kinds of cultivation we have mentioned, namely; the starving of the roots by keeping down all above ground growth. The smother crop by shading the land fully occupied, prevents effectual growth of quack grass that season, and where the soil has been properly prepared and the smother crop put in in good shape, there will be very few sickly quack grass plants that make headway that season. However, these few plants are sufficient to keep quack grass roots alive and they will lie dormant that year, and if given opportunity the next season, will soon become as vigorous as ever.

As above mentioned, we do not know of any one who has completely killed quack grass by the use of smother crops. We have heard some farmers claim that they have done so, but in-

vestigation has shown that in most of these cases the results have only been partially successful; that is to say, enough quack grass was killed so that the farmer was enabled to grow good crops, but complete eradication as is given by the Crane system, has not been shown.

Of the various crops used in smothering quack grass, buckwheat is, in nearly all cases, considered the best, for the reason that buckwheat can be planted later in the spring than most any of the other smother crops; it grows quite a dense foliage, and brings fair returns. An Iowa farmer, Mr. B. E. Strayer, of Fayette County, Iowa, reports, in an Iowa bulletin, the following method of fighting quack grass with buckwheat. Mr. Strayer says:

"Plow the ground very shallow early in the spring, then harrow until perfectly level, let it lie until about the 25th of June, when the quack grass and other weeds will have reached a large growth. Take three good horses and a sixteen-inch walking plow, and turn the ground over, plowing as deep as possible, using a heavy log chain attached to plow and whiffletree to pull the growth of vegetation into the furrow, so that it will be completely covered. Sow with buckwheat, and harrow lightly with slanting-tooth drag; harrow around the field, in the same direction

in which it was plowed, so as not to uncover any of the vegetation that has been turned under, or bring any of the quack grass roots to the surface. If the above treatment of ground that is infested with quack grass is carried out, little, if any of the weed will be left, and the crop of buckwheat will more than pay for the trouble.''

The Farmer Farm of Dakota county, Minnesota, reports the following experience in using various smother crops and systems of cultivation in fighting quack grass. In summarizing their experience in fighting quack grass during two or three years, the following suggestions are made by the management of The Farmer Farm:

''The method adopted at the Farmer Farm was to first get the seed bed in perfect condition by disking and dragging. Disking on hot days was found to work great damage to quack grass. After the corn was planted we endeavored to avoid the usual danger of scattering the weed caused by the use of the ordinary shovel and hence adopted surface cultivation. The Tower surface cultivator used cuts off the weeds just below the surface and lets them lie instead of carrying them over the field. This method of cultivation proved very successful and practically no quack grass remains at this time except dead

Fig. 18. Corn planted on quack sod. Quack is taking the crop. On next page note photo taken same day on opposite side of road where corn was planted same time on land free of quack.

Fig. 19. Corn on well prepared quack free land. See preceding photo taken same day on opposite side of road.

roots and we have a good crop of corn. We do not mean to say that the quack grass is all killed off, but it goes to show that quack grass can be very much subdued and a good crop of corn raised at the same time by using this method of cultivation, which is accomplishing a great deal more than is usually accomplished where quack grass is firmly established.

"We also experimented with other crops on quack grass land. In one field where the quack grass was particularly well sodded, the ground was plowed in late May after the quack grass was nearly waist high, and the whole sod turned under as deeply as possible. The ground was then put in condition and millet planted. The millet has come out very well indeed and given a good crop of hay, except in the low places, where the quack grass has killed it. On the high ground there is practically no quack grass mixed with the millet, but now that the millet has been removed it is sending up a few sickly plants. If allowed to have its own way it would doubtless be as firmly established as ever next year. On the millet ground we will put in corn next year and adopt the same method of cultivation used this season. The corn ground will probably be seeded to barley and clover sowed with it.

Fig. 20. It has often been noticed that clover will grow quite luxuriantly in quack field. In above pasture we have quack grass heads showing the complete growth of clover which shades the ground. Smother crops as shown above will weaken quack grass, but not destroy it.

"We also plowed some of the quack grass sod in June and put in sorghum. The results were practically as with the millet. A good crop was raised and the quack is now sending up spindly shoots. The quack grass has been hurt and kept in check, but not killed.

"On another farm we have observed what clover will do on quack grass sod, and we find that a good crop of clover has in some cases been raised even where the quack was very abundant; in fact we have seen one field partially infested with quack grass where the clover is higher on the quack sod than on any other part of the field. This leads us to believe that quack grass will do less damage in the meadow than on any crop on the farm. This is the best place to keep it until more active measures of cultivation are taken up.

"Quack grass land should not be cultivated at all unless it is cultivated thoroughly and not allowed the slightest advantage until a crop is well established.

"Quack grass will do the least damage in the meadow. The hay should be cut before the quack grass seeds are ripe. The plant will spread somewhat from the root, but not nearly so much as in a cultivated field.

"In order to kill quack grass it must be smothered, that is, its roots must be starved to death by keeping down all growth above ground. This starving of the roots may be accomplished by surface cultivation or by the growing of some crop which will prevent its making any above ground growth. Unless great care is used, the ordinary shovel plow in a wet season will do much to spread the growth of quack grass in other parts of the field. Smother crops, such as millet, sorghum, clover and buckwheat cannot be absolutely depended upon to kill quack grass, but if given sufficient headway in starting growth they will greatly damage the vitality of the plant, and other methods of eradication can then be taken up.

"Fall plowing or disking just before freezing weather, will kill a large proportion of quack grass roots. Disking in hot weather will have the same effect. Surface cultivation has proven eminently satisfactory at the Farmer Farm in growing a first-class field of corn on quack grass sod."

Mr. Thomas Harborn, late manager of James J. Hill's farm, gives the following experiences in

fighting quack grass in Stearns county, Minnesota:

"Don't plow your land or touch it in any way until about the 25th of May, so as to give the quack grass a good chance to get started. Then take a plow and put on a jointer instead of a rolling coulter. Then be careful in setting out your ridge to see that everything is thoroughly covered and plow as deep as possible. Then as soon as possible after it is plowed harrow thoroughly and make as good a seed bed as possible. Next take your corn planter and plant Triumph or any kind of corn that will grow a medium sized stalk and a good, heavy leaf. See that the corn cultivator teeth are thoroughly sharp and cultivate as often as possible. Then cut your corn and before it freezes up take a potato digger and run that on each row which will shake the soil from the roots and leave them on top of the ground and the frost of the winter will kill it, but if you think the roots are not dead take your rake and rake them out and burn them. Then plow and seed to small grain of any kind and with a seeding of clover you have got your land clean. If this does not clean it, repeat the former part of the program."

Mr. A. W. Trow, the well known agricultural

writer, gives the following suggestions in fighting quack grass:

"We have known of several first-class farmers in Olmstead county who start in to eradicate quack grass by first giving it close pasturing with horses or sheep. The longer and closer quack grass is pastured the nearer its roots come to the surface. After it has been pastured until the roots have come close to the surface, the ground is plowed very late in the fall, and it should be plowed extremely deep. If possible turn this furrow at least ten inches deep, and bear in mind that this plowing is of no account unless a flat furrow is turned; that is, turn the furrow completely upside down. This deep plowing with a flat furrow is to bury the quack grass, and afterward follow with a cultivated crop, but the cultivation should be shallow to avoid tearing up the sod and bringing the roots to the surface. We recently met an expert farmer from one of the large estates in Sweden, who informed us that deep plowing after close pasturing was a system of keeping back quack grass that is being quite generally followed in his country. He used the term 'keeping back,' as he claims it to be almost impossible to entirely eradicate it in their country where the precipitation is so heavy.

Fig. 21. Quack grass sod as turned with a breaker. A jointer should be used instead of coulter, that the slice will be turned over flat and not leave the edge sticking up as shown in the picture. [Scene on Mr. Crane's Farm.]

"When ground infested with quack grass is plowed before a sod is formed, or if the sod is of such a character that a flat furrow can not be turned, it is better to plow very late in the fall and leave the furrow standing on edge as much as possible, as there is nothing that will reduce the vitality of quack grass roots more than dry freezing, hence as above stated, there are two distinct methods for plowing quack grass—either bury it completely or turn the furrow on edge to be exposed to the frost, and the condition of the ground and the depth of the roots must determine which is the best plan to follow.

"In fighting quack grass it is well to remember that it has a few vulnerable points, that its roots, more than most other plants, are weakened by freezing, and especially when they are exposed in loose dirt. We do not mean by this that late fall rough plowing will destroy quack grass, but it is only a means of keeping it in subjection, and reducing its vitality as a preliminary to its ultimate eradication, by intensive cultivation or by the use of smother crops, such as millet, buckwheat or hemp. Quack grass roots do not thrive as well in loose dirt as in a compact soil. This being the case some of our farmers begin early in the spring stirring the ground with a four shovel

corn cultivator, and continue to go over the ground about once a week until the last of June or first of July, then sow to millet or buckwheat. This system in conjunction with the late fall rough plowing is a plan quite generally followed by our best Canadian farmers, but please bear in mind that this deep cultivation would not be advisable where an attempt was being made to smother the quack grass roots by extremely deep plowing."

The Iowa, North Dakota and Minnesota Experiment Stations have issued bulletins on the subject of weed eradication which are of service to farmers in studying the eradication of quack grass and other weeds. A few government bulletins may also be obtained for the asking.

A FEW STATEMENTS CONCERNING THE EFFICIENCY OF MR. CRANE'S METHOD.

STATE OF MINNESOTA

FARMERS' INSTITUTE

St. Paul, Minn., May 25, 1909.

To Whom it May Concern:

On Nov. 3, 1908, I visited the farm of Mr. P. B. Crane, at Long Lake, Minn., and went carefully over all his fields. I again visited his farm on May 21, 1909, and went carefully over the same fields. One field that grew wheat in 1908, and is now seeded to speltz, shows absolutely no signs of any quack grass. This field is said to have been badly infested with quack grass and was treated in 1907. A field from which a crop of quack grass hay was cut in 1908, was plowed August 1st and treated the balance of the season, and is now being planted to corn; we were unable to find any live quack grass in this field. I have no doubt of Mr. Crane's ability to eradicate quack grass.

A. D. WILSON,

Superintendent of Minnesota Farmers' Institutes.

TURNHAM & TALBERT
RAILROAD CONTRACTORS

LONG LAKE, MINN., JAN. 27, 1910.

TO WHOM IT MAY CONCERN:

Being a neighbor of Mr. Crane's and having some witch grass on my farm, am naturally very much interested in his system of cultivation, as I believe this is one of the hardest problems the farmers of this community have to contend with.

On examining the soil after witch grass has been killed, I find it to be in as good condition as clover sod that has been broken up, and the corn in his crib this year certainly testifies to the value of the soil. Have just taken a trip through the corn belt of Iowa and I saw no corn that could compete, in all ways, with the corn Mr. Crane has raised on this same land he has redeemed from witch grass.

Others have failed on one or two acres while by his system hundreds of acres can be easily reclaimed and as a means of fertilization his system is unequaled.

His discovery will be worth many dollars to farmers in our vicinity and is brought within the means of all.

Mr. Crane is certainly entitled to great credit and his achievement in this line should be recognized by the public.

GEO. A. TURNHAM,
Chairman of Supervisors, Township of Orono.

MINNESOTA EDUCATIONAL ASSOCIATION

J. M. GUISE, Corresponding Secretary

ST. PAUL, MINN., May 24, 1909.

TO THOSE WISHING TO RID THEMSELVES OF QUACK GRASS:

That Mr. P. B. Crane of Long Lake, Minn., is able to destroy permanently, quack in its worst form, has been demonstrated to my entire satisfaction. Living a neighbor to Mr. Crane, I have watched his work with interest and must confess with some incredulity at first.

Last summer I examined fields in which he had used his method of cultivation and found them looking like a garden, where formerly they were perfect mats of quack.

One field which had been treated in the summer of 1907 was seeded to wheat in 1908 and last Fall when I examined this field there was no sign of quack. This spring, just yesterday, when I examined it, I found a good crop of speltz growing on this field and not a single spear of quack has put in an appearance, showing that the ground had been effectively cleaned of the quack.

Another field from which a crop of quack grass was cut for hay in July of last summer, was treated and when examined last fall was found

free from any living quack. This spring this field is planted to corn and a very careful examination failed to disclose a single spear of living quack.

If Mr. Crane is able to accomplish such effective results on a farm that was infested as badly as I knew his to be, I see no reason why the same method of treatment should not prove equally effective any place that it is put in operation.

I believe Mr. Crane's method, which he has worked out after long experimenting, will prove a boon to the many farmers in Minnesota who are fighting against this pest.

Very respectfully yours,

JOHN M. GUISE.

SAMELS BROS.
MANUFACTURERS OF BUTTER

MINNEAPOLIS, MINN., Jan. 19, 1910.

TO WHOM IT MAY CONCERN:

This is to certify that I have personally called on Mr. P. B. Crane, of Long Lake, Minn., in June, and it so happened that he was breaking a piece of quack grass land the day that I called on him; this gave me a chance to see the grass before it was turned over. I again called on him in September to examine the same field, and found that he had made a complete eradication of the quack grass in this field. I also examined several other pieces of land that he had treated, and was unable to find any quack grass in any field that had been treated, while there was plenty of the quack grass in the adjoining fields. I am fully convinced that Mr. Crane has the right method and the right preparations, and I bought enough compound for 20 acres. I have treated my land and have every reason to believe that the quack grass has been killed.

Yours respectfully,

W. H. SAMELS.

THE DAKOTA FARMER

PROF. THOS. SHAW, Associate Editor

ABERDEEN, S. D., Oct. 5, 1909.

TO ALL WHOM IT MAY CONCERN:

This is to certify that I visited the farm of Mr. P. B. Crane near Long Lake, Minn., on Aug. 28th, 1909. Mr. Crane showed me ground that was plowed up on May 21st to the depth of 7 inches. It had been mowed for quack grass hay for four years previously. It was treated on May 20th with a spray that Mr. Crane has discovered and which he uses once on the quack before it is plowed. This ground was subsequently double disked five times. I could not find a blade of living grass on it, though I searched carefully above and below the surface. The roots were plentifully present below the surface, but they were all dead. I examined other fields that Mr. Crane had treated in previous years, and not a blade of the quack was to be found on them. The method followed by Mr. Crane is certainly effective. I am watching, with interest, his experiments in killing quack at different seasons. He has never failed thus far in destroying every plant in the fields where he has undertaken the work of eradication.

THOMAS SHAW.

W. W. CARR & SONS
GENERAL MERCHANTS

CRYSTAL BAY, MINN., Feb. 5, 1910.

TO THE PUBLIC:

We are pleased to state that Mr. P. B. Crane has been a neighbor of ours for a number of years, in fact, his farm is just across the county road from ours, so we have had a good opportunity to watch his progress upon his matted quack grass fields since he purchased the property. His progress seemed very slow and almost ineffective for several years, but since 1908 he has had the quack grass correlled, for on his fields that were solid beds of quack grass for the last 30 years and worthless, he is now raising just as fine crops as any one in the state of Minnesota. His eradication of quack grass, under his methods of killing, is wonderful and permanent, and it will bring back into use many of the unclaimed acres of our state.

Very truly,

W. W. CARR & SONS.

THE CITY NATIONAL BANK

W. J. MOORE, President

TIPTON, IOWA, Aug. 10, 1909.

TO WHOM THIS MAY CONCERN:

This is to certify that I have recently visited the farm of P. D. Crane near Long Lake, Minn., I have examined his fields now under cultivation, and find his method of eradicating quack grass to be all that he claims for it. I believe it to be the only solution known at the present time to thoroughly destroy quack grass effectively.

Respectfully,

W. J. MOORE.

LONG LAKE, MINN., May 24, 1909.

TO WHOM IT MAY CONCERN:

This is to certify that I have this day re-examined the fields on which my friend Peter B. Crane killed quack grass during the summer of 1908 and cannot find a spear of this kind of grass and I believe that he has thoroughly eradicated it root and branch.

I am convinced that his system is a success.

Very truly yours,

A. W. PAGE.

LAW OFFICES OF
W. L. HURSH

MINNEAPOLIS, MINN., Jan. 19, 1910.

TO WHOM IT MAY CONCERN:

I reside at Long Lake, Minnesota, about a mile and a half from the forty acre farm of P. B. Crane. I have been familiar with the condition of the Crane farm for the last twenty-five years, and during all that time until within the last few years, this farm has been thoroughly polluted with Quack Grass, so much so that it was almost impossible to raise a paying crop on any part of it, while parts of it were so matted with the Quack Grass that nothing could be grown.

I have been watching Mr. Crane's experiments for several years past and have been upon the farm at different times to see what progress he was making, as I had some Quack Grass land of my own.

For a number of years he made very little progress, but during the seasons of 1908 and 1909, he thoroughly cleaned out the several tracts that he worked on. I examined part of his farm in the fall of 1908 and found no Quack Grass in a field where in the spring there had been nothing but Quack Grass. I examined this field

again in the fall of 1909 and there was no Quack Grass.

At the same time I examined other fields which in 1908 were full of Quack Grass, and was unable to find any Quack Grass roots.

Mr. Crane has certainly hit on the right method of eradicating Quack Grass as he has turned the most worthless farm in our neighborhood into one of the best cultivated tracts, free from weeds and Quack Grass, in the country.

Under his direction and following his suggestions I have completely eradicated Quack Grass from two acres of land at my home, which was so taken by Quack Grass that nothing else would grow on it. Quack Grass can be eradicated with the ordinary farm tools within one season if Mr. Crane's method of procedure is carefully followed.

Yours truly,

W. L. HURSH.

C. D. LYDIARD
Dealer in
GENERAL MERCHANDISE

LONG LAKE, MINN., Nov. 30, 1909.

TO WHOM IT MAY CONCERN:

This is to certify that I have been acquainted with Mr. P. B. Crane for a number of years and have known the farm on which he lives for over thirty years, and can truthfully say that when Mr. Crane bought this farm it was the worst bunch of quack grass that I had ever seen.

Mr. Crane went after this with a determination to kill it out, but, for seven years the quack still had the best of the situation. From that time on it has gradually disappeared, field by field until today he has a reclaimed quack grass farm.

Cleaner fields or more perfect condition of soil I have never seen in any state, and the crops that this reclaimed quack grass land produces are far superior to that produced by the virgin soil.

Some of this land has been tilled for over fifty years, and not a particle of fertilizer has ever been applied, and no person would give one dollar per acre for the use of it. This season it

produced one hundred and six baskets of corn to the acre on one field and 40 bushels of speltz on another, proving that quack grass is a grand good restorative to the soil.

Mr. Crane is writing up his system of eradication in book form. Every "quack grass" farmer should get a book and know how to reclaim quack grass lands.

Very sincerely yours,

C. D. LYDIARD, P. M.

STATE BANK OF LONG LAKE

ROY H. JEWETT, Cashier

LONG LAKE, MINN., Nov. 30, 1909.

TO WHOM IT MAY CONCERN:

This is to certify that I am well acquainted with Mr. P. B. Crane and am very familiar with the condition of his farm on which he has been eradicating quack grass. I can truthfully say that his farm was the worst mat of quack grass that I have ever seen.

Mr. Crane has thoroughly demonstrated the fact that quack grass can be eradicated. He has done this work himself, and it is just wonderful to see the reformation that he has worked on his farm. Where nothing but quack grass grew in 1908 he raised 106 baskets of corn to the acre this season, and not a particle of fertilizer was applied to this field. Today, his fields are as clean and free from quack grass as any garden ever was, and the soil is as mellow and rich as any soil could possibly be. Mr. Crane predicts 70 bushels of corn to the acre next season and it certainly looks as though he would get it.

His method of eradicating quack is practical, and any and every farmer can attain same results by applying Crane's system of cultivation

which he is now writing and will have in book form so that every tiller of the soil can have one, and with this in his possession can proceed to reclaim his quack grass lands. This means many millions of dollars to the quack infested districts of the United States.

Respectfully submitted,

ROY H. JEWETT, Cashier.

C. B. HUSCHKE
MANAGER

MORGAN, MINN., Feb. 2, 1910.

MR. P. B. CRANE:

DEAR SIR: I just had a letter from Mr. C. O. Gilfillan, telling me that you wished to know what success we had with the Quack Grass last season. I must say we did not give same a fair trial. I could not get the team onto the land because we had to hire a team, but this season we will try and have a team on hand of our own, but this field might be better than we look for when spring opens up; as yet, can't say. We are going at it in the spring again on another field and try and follow your directions to the letter.

Yours respectfully,

C. O. GILFILLAN.
By C. B. Huschke, Agt.

LAKE WILSON, MINN., Feb. 7, 1910.

P. B. CRANE, Esq., Long Lake, Minn.:

DEAR SIR: Yours of the 25th to hand and glad to hear from you once more and that you are having such heavy crops on your reclaimed quack land. It seems to me that one of my letters must have miscarried, or been lost in the mails. I continued the cultivation of my patch until the middle of October before I put in the corn plow to tear up the sod. I had the most favorable weather in September for my work I had had all the season. After turning up the sods I still found a few live roots in three different patches; these patches were in the wettest part of the field and did not get as much work as the other part of the field on account of so much rain. I cultivated the whole piece once each way and where the sod was heaviest in the wet places, twice each way, and when I examined the field just before it froze up I still found a few live roots, but I had to hunt for them pretty close by taking a piece of the sod in my hand up carefully to find the small pieces that still had a little life left, but am perfectly satisfied. If I had had a favorable season I would have had a clean field. I have fifteen cans of the mixture left yet and will try another piece this spring, so I

will have to get the sprayer shipped down here again in the spring as I would like to start about the tenth of May or just as soon as corn is planted. In your letter of 25th inst. you said you were getting out some new printed matter, and would like to have me give my experience with your treatment. I have given you a true statement, in the above and don't think it will be any good to be used in your publication. I would also say in regard to your treatment in this neighborhood, the neighbors have not taken any in the same as far as I can see. I never had one visit my field all season; of course, when in town, there were lots of inquiries after Mr. Quack and if he was dead yet, but I never heard one of them say they would try a piece next year, and some of them think that I was an easy mark to be caught in such a scheme. Hoping to hear from you soon and wishing you success in killing Quack,

Yours respectfully,

WILLIAM SCOTT.

STANDARD
AGRICULTURAL BOOKS

Published and Sold By

WEBB PUBLISHING COMPANY,

ST. PAUL, MINNESOTA

AGRICULTURAL.

POPULAR FRUIT GROWING, by Samuel B. Green. This book covers the factors in successful fruit growing, with list of fruits adapted to each state; orchard protection, injurious insects, diseases injurious to fruits, spraying, harvesting, propagation of fruit plants, etc., etc. It is prepared especially for beginners and as a text book for schools and colleges. 309 pages, 120 illustrations. **Price, postpaid..$1.00**

AMATEUR FRUIT GROWING, by Samuel B. Green, a practical guide to the growing of fruit for home use and the market, written with special reference to a cold climate. **Illustrated. 134 pp. Price, 12 mo.....Paper, 25 cents; cloth, 50 cents.**

VEGETABLE GARDENING, by Samuel B. Green. 10th edition. A manual on the growing of vegetables for home use and the market, **profusely illustrated. 252 pp.**
Price, 12 mo.....Cloth, $1.00; paper, 50 cents.

ELEMENTS OF AGRICULTURE, by J. H. Sheppard and J. C. McDowell, a complete treatise on practical agriculture covering plant and animal breeding, thoroughly illustrated. A complete text book adopted in public and agricultural schools throughout the Northwest. **12 mo., cloth, 100 pp. Price, $1.00**

GRASSES AND HOW TO GROW THEM, by Thomas Shaw, covering name and character of all the principal grasses in America; temporary and permanent pastures; methods in making hay, etc. **Illustrated, 453 pp.**
Price, 12 mo.....Cloth, $1.50

WEEDS AND HOW TO ERADICATE THEM, by Thomas Shaw, giving the names of the most troublesome weed pests east and west and successful methods of destroying them.
Price, 16 mo., 210 pp. .....Cloth, 50 cents; paper, 25 cents.

EVERGREENS AND HOW TO GROW THEM, by C. S. Harrison. A complete guide to selection and growth of evergreens for pleasure and profit, from seed and nursery, to wind-breaks, and hedges. **Illustrated, 100 pp.**
Price, 12 mo. .....Paper, 25 cents; cloth, postpaid, 50 cents.

FARM WIND-BREAKS AND SHELTER BELTS, by Samuel B. Green. A manual of tree planting for wind-breaks and shelter with description of the most suitable trees hardy enough to stand Northwestern conditions. Practical cultural directions from seed to maturity. **Illustrated, 69 pp.**
Price .....Paper, **25 cents.**

HARDWOOD LANDS, by D. A. Wallace, describes the characteristics of Minnesota and Wisconsin cut-over timber lands heretofore overlooked as suitable for agriculture. **Illustrated. Price** .....Paper, **25 cents.**

THE GOLD MINE IN THE FRONT YARD, by C. S. Harrison. A book about flowers, both for ornamentation and commercial culture, written with special reference to Northwestern conditions. **Illustrated, 280 pp. Price, 12 mo.**....Cloth, **$1.00**

POULTRY.

POULTRY MANUAL, by Franklane L. Sewell and Ida E. Tilson. A safe guide to successful poultry culture in all its branches, fancy and practical; breeding and feeding; diseases and remedies; how to make farm poultry pay, etc., etc. **(40th Thousand. Revised Sept. 1, 1908.)**
12mo., 148 pp. Price .....**50 cents; paper, 25 cents.**

EGG MONEY, HOW TO INCREASE IT, by H. A. Nourse. A book of complete and reliable information on the more profitable production of eggs on the city lot, the village acre and the farm. The instruction in this book will make the "200 eggs a year hen" a reality for the intelligent poultryman. **128 pp., completely illustrated. Price,** paper, **25 cents.**

POULTRY HOUSES, COOPS AND EQUIPMENTS, by H. A. Nourse. A book of newest plans for bulding practical, up-to-date poultry houses, with description of coops, fixtures and poultry utensils for the farm or village poultry keeper. **Profusely illustrated, 100 pp. Price**.....Paper, **25 cents.**

CHICKS: HATCHING AND REARING, by H. A. Nourse. A manual of dependable instruction in incubating, brooding, housing and developing winners and layers, fattening, killing and marketing broilers and roasting chickens. **126 pp., fully illustrated. Price**.....Paper, **25 cents.**

SIMPLE POULTRY REMEDIES, by competent authors; describes the symptoms of the leading diseases of poultry and tells how they may be cured or prevented by simple methods. This book should be in the hands of every poultry man. **80 pp., fully illustrated. Price, postpaid**.....**25 cents.**

TURKEYS, DUCKS, AND GEESE, by H. A. Nourse, latest and most complete and reliable information on breeding, hatching, rearing, fattening, developing, showing, and selling for pleasure or profit. **128 pp., fully illustrated.**
Price, postpaid.....**50 cents.**

STANDARD AGRICULTURAL BOOKS

LIVE STOCK.

FEEDING AND MANAGEMENT OF LIVE STOCK, by Thomas Shaw. A series of lectures on the principles covering selection, feeding, breeding, management and marketing of cattle, sheep and swine. **100 pp.**
Price, 8 mo. .....Cloth, $1.00; stiff cover, **50 cents.**

FIVE HUNDRED QUESTIONS ANSWERED ABOUT SWINE, by L. H. Cooch. This manual is practically a complete veterinary book for swine breeders. Not only does it contain answers to questions concerning diseases of swine, but it also fully and carefully compares the different breeds, treats of breeding, feeding and pasturing. **Price,** paper, **25 cents.**

THIRTY DAIRY RATIONS. Thirty complete balanced dairy rations. Treats also of the feeding and care of dairy cows, by H. C. Carpenter. **Illustrated. Price,** paper, **25 cents.**

MISCELLANEOUS.

FARM BLACKSMITHING, a complete treatise on blacksmithing by J. M. Drew, written for farmers who want a workshop where they can profitably spend stormy days. **Illustrated, 100 pp. Price, 12 mo.** .....Cloth, **50 cents.**

STANDARD BLACKSMITHING, HORSESHOEING AND WAGON MAKING, by J. G. Holmstrom, author of "Modern Blacksmithing," gives practical instructions by a successful blacksmith. The latest and most complete book on the subject published. **Thoroughly illustrated.**
Price, 12 mo. .....Cloth, **$1.00**

THE FARMER'S TANNING GUIDE, by G. E. Stevens, gives all the quick ways of tanning in from ten minutes to six weeks. Also complete receipts for making your own solutions. Prepared especially for farmers. **Price** .....Paper, **25 cents.**

VACANT GOVERNMENT LANDS, locates all available government lands that can be secured free by entry and tells how to get them. All about irrigated lands and how obtained free. (1908 Edition.) **112 pp. Price**.....Paper, **25 cents.**

THE DOMINION OF CANADA, by Moses Folsom. All about free government land in Canada and how to get it. **155 pp.**
Price, 12 mo. .....Cloth, **50 cents;** paper, **25 cents.**

THE COUNTRY KITCHEN. Nine hundred tried and tested recipes suited to the country and contributed by readers of The Farmer. The most popular and practical cook book on the market. **154 pp.**
Price, 12 mo. .....Cloth, **50 cents;** paper, **25 cents.**

THE "BUCKEYE" COOK BOOK, by Mrs. Wilcox. A careful compilation of tried and approved recipes for all branches of the household. **1288 pp. with complete index.**
Price, postpaid **$2.50**

STANDARD AGRICULTURAL BOOKS.

FARM BOOKS.

SHORT TITLE LIST.

Farmers' Account Book and Farm Record, net	$2.25
Bookkeeping for Farmers. Clark Atkeson	.25
Barn Plans and Out Buildings	1.00
Cottage Houses. S. B. Reed	1.00
Homes for Home Builders. D. W. Wing	1.00
A. B. C. and X. Y. Z. of Bee Culture. A. I. Root	1.50
Mysteries of Bee Keeping Explained. L. C. Root	1.00
Veterinary Elements. Arthur G. Hopkins	1.50
Diseases of Horses and Cattle. D. McIntosh	1.75
Feeds and Feeding. W. A. Henry	2.00
Diseases of Swine. D. McIntosh	2.00
Swine in America. F. D. Coburn, net	2.50
Farm Live Stock of Great Britain. R. Wallace, net	5.00
Profitable Dairying. C. L. Peck	.75
Judging Live Stock. John A. Craig, net	1.50
Creamery Accounting. J. A. Vye, net	1.00
Cattle Breeding. William Warfield	2.00
Practical Forestry. A. S. Fuller	1.50
Beautifying Country Homes. J. Weidermann	10.00
Garden Making. L. H. Bailey	1.00
Practical Floriculture. Peter Henderson	1.50
Spraying Crops. C. M. Weed	.50
Spraying of Plants. E. J. Lodeman, net	1.50
Agriculture with Some of Its Relations with Chemistry. F. H. Storer (3 volumes), net	5.00
Pruning Book. L. H. Bailey, net	1.50
Field Notes on Apple Culture. L. H. Bailey, net	2.00
The Potato. J. J. H. Gregory	.30
Gardening for Profit. Peter Henderson	1.50
The Soil. Franklin H. King	1.00
Principles of Agriculture. L. H. Bailey, net	1.50
Physics of Agriculture. F. H. King, net	1.75
How To Make a Garden Pay. T. Greiner	1.00
Soiling Crops and the Silo. Thomas Shaw	1.50
Forage and Fibre Crops in America. Thomas Hunt	1.75
Fertility of the Land. I. P. Roberts, net	1.50
Farm Machinery and Farm Motors. J. B. Davidson and L. W. Chase, net	2.00
Manual of Corn Judging. A. D. Shamel	.50
Cereals in America. T. F. Hunt	1.75
Alfalfa, Book of. F. D. Coburn	2.00

WEBB PUBLISHING COMPANY,
ST. PAUL, MINNESOTA

AGRICULTURE FOR YOUNG FOLKS

BY A. D. WILSON

A book on Agriculture for the beginner. It deals largely with common farm practices, rather than with scientific principles. Many of the complex problems encountered in the management of the farm are discussed in this book with a view to simplifying them, so that anyone may easily understand the principles involved.

This book will prove valuable to farm managers, by enabling them to put into practice some of the better methods of soil and live stock management, and to clearly see the aspects of farming as a business.

Each subject is handled in a thoroughly practical manner so that the principles taught can be applied to nearly every farm.

It is compiled in simple easy-to-understand language and the subjects subdivided in a manner that avoids every possibility of confusion.

A thorough guide for the beginner—a help to the experienced farm manager—and indispensable to the rural school or any elementary course in agriculture.

Cloth bound, fully illustrated, over 300 pages, over 100 illustrations; attractively compiled and printed on high grade paper.

Price $1.00 Postpaid

Webb Publishing Co.

ST. PAUL, MINN.

0161 ST. NIM.

One copy del. to Cat. Div.

JUN 13 1916

LIBRARY OF CONGRESS
0 002 819 745 7